POLICY GUIDELINES FOR THE INTEGRATION OF RESOURCE OPERATIONS AND URBAN DEVELOPMENT

THE CITY OF Edmonton PLANNING AND BUILDING

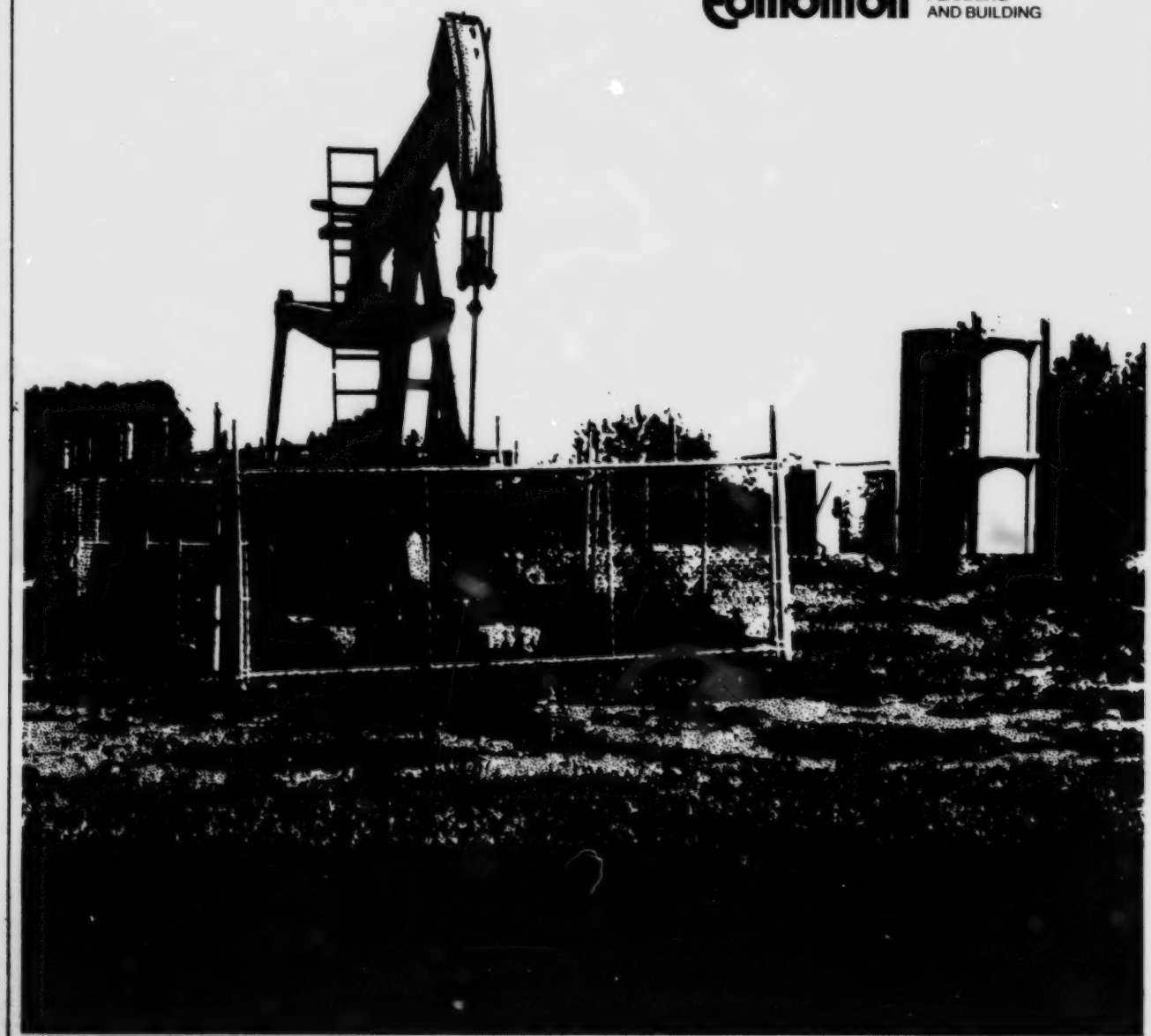

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TABLE OF CONTENTS

PAGE

Executive Summary i

History 1

Discussion 2

Policy Guidelines 3

Appendices

Appendix 1 - Map Illustrating Resource Operations Within the City of Edmonton

Appendix 2 - Summary of the Energy Resources Conservation Board's Recommendations

Appendix 3 - Glossary of Terms

Appendix 4 - Illustration of the Recommended Treatment of Resource Sites Under Plans of Subdivision

Appendix 5 - Examples of Tentative Plans of Subdivision for Resource Sites

Appendix 6 - Guidelines for Surface Improvements

Appendix 7 - Example of A Landscape Plan

Appendix 8 - Summary of Relevant Sections of the Oil and Gas Conservation Regulations

Appendix 9 - List of Resource Companies Operating Facilities within the City of Edmonton

EXECUTIVE SUMMARY

Following from the Local Authority Board's decision regarding the City's major annexation proposal, numerous oil and gas operations were incorporated into the City of Edmonton. Given the expected 10 to 20 year production life for many of these operations, it became evident that some encroachment of urban uses on existing resource operations would occur over the next two decades. Hence, a question regarding the potential co-existence of resource activities and urban development was raised.

In response to requests from the City, the development industry and the resource industry, the Energy Resources Conservation Board conducted an inquiry into the possible conflicts between resource development and urban development. The Board concluded that the successful co-existence of resource operations and urban development can be achieved through careful planning and the establishment of special operating measures for resource installations within an urban environment. As such, the Board established a series of special measures relating to wells, batteries, pipelines and gas processing.

As the mandate of the Board is limited to matters pertaining to resource operations, it became apparent that complementary policy directives pertaining to urban development were also required in order to ensure the successful integration of resource operations into an urban setting. The purpose of this report is to provide complementary policy guidelines to be applied by the local approving authority in reviewing development proposals for areas constrained by the presence of resource operations.

Summary of Recommendations

This section of the report summarizes the guidelines to be applied in reviewing development applications in the vicinity of resource operations. It should be noted that conformance with the policy guidelines embodied herein does not absolve a proponent for urban development from complying with the provisions of The Oil and Gas Conservation Act, The Planning Act, The Pipe Line Act, and any other applicable statute. In addition, the proponent is expected to comply with relevant policy documents prepared by the Energy Resources Conservation Board or any other agency of the Crown.

The policy recommendations are summarized under the following topical headings:

- resource consolidation plans
- development setbacks
- urban design considerations
- surface improvements
- operating guidelines
- submission and circulation requirements

1.0 Resource Consolidation Plans

1.1 That mineral operators be requested, through the Energy Resources Conservation Board, to undertake the preparation of a Resource Consolidation Plan for those lands falling within a recognized planning area following Council's

authorization for the preparation of an Area Structure Plan. Resource plans shall be completed prior to the adoption of Area Structure Plans.

2.0 Development Setbacks

2.1 Subject to conformance with the surface improvement requirements outlined in Section 4.0 of this report, the minimum separation distance between a well bore and the edge of the nearest developable parcel shall be 50 metres (164 feet).

2.2 Subject to conformance with the surface improvement requirements outlined in Section 4.0 of this report, the minimum separation distance between the edge of a battery lease and the edge of the nearest developable parcel shall be 50 metres (164 feet).

2.3 The minimum separation distance between the edge of a flowline right-of-way, or any other pipeline right-of-way for a pipeline forming part of a collection or gathering system, and the nearest building shall be 2 metres (6.56 feet).

2.4 In putting forward a development plan for lands adjacent to transmission pipelines, the proponent shall conform to the City's policy guidelines pertaining to the integration of transmission pipelines and urban development.

2.5 No school or other institutional building, where people are dependent on others for evacuation shall be located nearer than 100 metres (328.1 feet) to any well or battery facility unless the separation distance is relaxed to a minimum of 60 metres (196.9 feet) following a detailed review by the Planning and Building Department in consultation with the Energy Resources Conservation Board, the City Fire Department and the City's Emergency Planning Officer.

2.6 The normal separation distance between a well bore and the nearest edge of the right-of-way for a public roadway shall be 40 metres (131 feet) unless the normal separation distance is relaxed following a review by the Planning and Building Department in consultation with the Energy Resources Conservation Board, the City Fire Department, the City's Emergency Planning Officer, and the Transportation Department at the subdivision stage.

3.0 Urban Design

3.1 The ultimate size for all resource leases within a recognized plan area shall be determined by the proponent in consultation with affected mineral owners, the Energy Resources Conservation Board and the Planning and Building Department prior to the approval of an industrial Area

Structure Plan (ASP) or a residential Neighbourhood Structure Plan (NSP). Preliminary negotiations in this regard should commence during the preparation of Area Structure Plans.

3.2 The general alignment of all flowlines and any other pipelines forming part of a gathering or collection system shall be finalized prior to the approval of an industrial ASP or residential NSP.

3.3 The proposed future urban uses to which resource leases will be put following the abandonment of resource operations shall be determined at the Neighbourhood Structure Plan stage (residential areas) or the Area Structure Plan stage (industrial areas).

3.4 The detailed roadway design, as provided for under ASPs/NSPs, shall ensure that access to all resources leases shall be provided from either an arterial road or a major collector road in accordance with the access guidelines of the City of Edmonton.

3.5 Within a plan of subdivision the entire area of a resource lease and any required buffer lands shall be treated as a separate lot. Municipal reserves owing against the resource lot shall not be deferred, but shall be required in accordance with the provisions of The Planning Act, RSA 1980, as amended.

3.6 In conjunction with an application to subdivide lands in the vicinity of a resource lease, the proponent shall submit a tentative subdivision design showing that those lands comprising the resource parcel can be satisfactorily subdivided, serviced and developed in a manner which is compatible with the surrounding area following the abandonment of resource operations.

4.0 Surface Improvements

4.1 In conjunction with an application for subdivision, the proponent shall file for each resource parcel a landscape plan prepared by a qualified landscape architect and detailing the following: a planting scheme, suitable screen fencing, suitable hard surface landscaping, a colour scheme for the painting of resource equipment, the proposed lighting of sites, signage of sites, and any other details deemed relevant by the Municipal Planning Commission.

4.2 In conjunction with an application for subdivision, the proponent shall file for each flowline right-of-way a landscape plan prepared by a qualified landscape architect and detailing surface improvements on the pipeline right-of-way.

5.0 Operating Guidelines

5.1 Whenever possible the petroleum liquids produced shall be removed from a well site by underground pipelines.

5.2 In situations where it is necessary to remove petroleum products from a well site located within a residential or commercial district by tanker truck, with the exception of cases of emergency, truck movements shall be limited to the daytime hours of 7:01 hours to 20:00 hours, Monday through Saturday, excluding legal holidays.

5.3 With the exception of cases of emergency, major construction activities (e.g., well workovers, major equipment repairs, etc.) on lease sites in an urban area shall be limited to the daytime hours of 7:01 hours and 20:00 hours, Monday through Saturday, excluding legal holidays.

5.4 As prescribed by the ERCB, with the exception of cases of emergency no continuous flaring is permitted on lease sites within an urban area. Emergency flare equipment within an urban area should take the form of incineration type flare equipment as opposed to stack flares.

6.0 Submission and Circulation Requirements

6.1 In conjunction with any plan to develop lands in the vicinity of resource operations, the proponent shall disclose the following information: the name and address of all resource companies operating within the plan area and particulars regarding existing resource operations (size of lease, equipment on site, and the nature of current operations, etc.).

6.2 In reviewing a proposed plan for developing areas contained by the presence of resource operations, the Planning and Building Department shall circulate a copy of the proposed plan to each affected resource company, the Energy Resources Conservation Board (2) and any other relevant agency for review and comments.

6.3 The proponent shall, in addition to the normal submission requirement, submit sufficient copies of the proposed plan for circulation to each affected resource company, the Energy Resources Conservation Board (2), and any other relevant agency.

HISTORY

The rationale underlying the major annexation, effective 1982 01 01, was to ensure an adequate supply of land within the corporate limits of the City of Edmonton to accommodate urban development over the long term future. The addition of 35,000 hectares (86,000 acres) of land in virtually all directions secures sufficient land to provide for the City's needs well beyond this century. The majority of the lands incorporated are currently undeveloped agricultural land thereby providing the City with a long term supply of vacant land. However, substantial oil and gas reserves underlie portions of the newly annexed lands. Exploitation of these reserves requires surface locations for extraction and processing operations. Hence, existing and proposed resource facilities pose a potential conflict for future urban expansion.

Existing resource operations are concentrated along the west, southwest, and northwest periphery of built-up areas of the City (see Appendix 1). Through the influx of applications for new resource installations following the annexation decision, it became apparent that mineral owners and resource operators wish to exploit, to the greatest extent possible, existing proven reserves prior to the surface lands overlying the resources being totally engulfed with urban development. Obviously, the local resource industry and the Board are concerned that urban encroachment may result in a lost opportunities in accruing the benefits from depleting proven resources.

As the operating life of many of the existing resource operations is in the order of 10 to 20years, it is likely that urban uses will begin to encroach on existing resource sites over that timeframe. While the extent of urban encroachment is dependent upon the amount of vacant land required to accommodate urban growth, the fact that there will be a certain degree of interface between resource developments and urban uses poses a question regarding the potential co-existence between these conflicting land uses. As such, the City of Edmonton, the local developers and numerous resource companies requested that the Energy Resources Conservation Board (Board) hold an inquiry into the matter of the co-existence of resource installations and urban development in the West Edmonton Area.

Although the proposed inquiry focussed on a particular area, it was anticipated that the conclusions of the inquiry may apply in similar circumstances throughout the Province where the issue of the co-existence of resource development and urban uses became a matter of concern.

In response to requests from a number of interest groups, the Board conducted a inquiry into the matter of co-existence of resource developments and urban uses in West Edmonton in March and April of 1983. The Board published its findings in July of 1983 within a report entitled ERCB Inquiry - Resource Development/Urban Development West-Edmonton Area.[1] The major conclusion of the inquiry report was that the successful co-existence of resource operations and urban uses can be achieved through the application of special operating measures for resource installations and careful planning.

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1 Energy Resources Conservation Board, ERCB Inquiry - Resource Development/Urban Development West Edmonton Area - ERBC Inquiry Report D83-F, July 1983.

DISCUSSION

There are two main issues associated with the successful co-existence of resource installations and urban development. These are: health and safety concerns and quality of life considerations.

Although the Board's inquiry report focussed on the alleviation of health and safety concerns[2], the report also put forward a number of recommendations intended to ameliorate the negative impacts of resource operations on the quality of life in an urban environment[3]. However, the Board is constrained by its statutory mandate in comprehensively addressing quality of life matters in that the Board has no direct control over development activity in the vicinity of resource operations. Approval authority for urban development plans lies with the local municipality. In order to achieve the successful co-existence of resource development and urban uses both health and safety concerns and quality of life considerations must be adequately addressed.

It becomes apparent that the successful integration of resource installations within an urban setting will require substantial co-ordination between the actions of the Board and the actions of local municipalities. Indeed, it is imperative that policy initiatives applied by a local approving authority complement the actions of the Board by ensuring compliance with the Board's recommendations and by addressing relevant matters which are beyond the jurisdiction of the Board.

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2 In an effort to address the health and safety problems the Board put forward a number of recommendations regarding minimum separation distances and special operating measures for resource installations in an urban setting. These recommendations are summarized in Appendix 2. (Source: op cit I - Appendix III).

3 Examples of the Board's recommendations pertaining to quality of life concerns include: a requirement for vapour recovery tanks to control odour problems and a requirement for the replacement of internal combustion engines with electric motors to reduce noise levels. Appendix 2 provides a summary of the Board's recommendations in this regard. (Source: op cit I - Appendix III).

POLICY GUIDELINES

As was mentioned previously, the Board's inquiry report focused on measures geared toward ensuring adequate levels of public health and safety. This report will put forward municipal policy guidelines which will ensure conformance with the Board's recommendations in this regard. However, the primary focus of this report centres on the development of mechanisms to ameliorate the nuisance impacts (aesthetic concerns, noise, odour, dust etc.) associated with developing lands in the vicinity of resource installations. In addition, as the effective integration of resource facilities and urban development also poses a number of urban design issues, the report will include a number of guidelines pertaining to the design of areas constrained by the presence of resource installations. Finally, as the development of optimal integration concepts will require substantial negotiation between affected parties (the ERCB, resource companies, developers and the Civic Administration), the report includes recommendations which inject the opportunity for such discussions within the context of the existing plan preparation, circulation, review and approval processes.

Following a review of the Board's inquiry report, the Planning and Building Department has identified a number of specific issues that can and should be addressed in a municipal policy report in this regard. These are:

1.0 Resource Consolidation Plans
2.0 Development Setbacks
3.0 Urban Design Considerations
4.0 Surface Improvements
5.0 Operating Guidelines
6.0 Submission and Circulation Requirements

The main body of the report is organized according to the preceding headings. Under each heading the issues are discussed in greater detail. In addition, specific policy recommendations are developed for each of the issues.

As a number of planning or resource terms used in the main body of this report may not be totally familiar to all readers, a glossary of terms is appended to the report (see Appendix 3).

1.0 RESOURCE CONSOLIDATION PLANS

In the West Edmonton Inquiry Report, the Board noted that in urbanizing areas "there is a need for a greater degree of co-operation among mineral operators, particularly as it relates to the joint use of existing and future well sites and pipeline rights-of-way and to the consolidation of production facilities". In essence, the Board recognized that a reduction in frequency of occurrence and spatial extent of resource sites would substantially reduce the potential for conflict between resource uses and urban development. As such, the Board advocated the preparation of resource consolidation plans by resource companies operating facilities in urbanizing areas.

The purpose of these resource consolidation plans is to minimize the establishment of new surface leases, optimize the use of existing facilities, and remove the most offensive aspects of resource operations (e.g., continuous flaring) from urban areas. As the preparation of such plans will ensure that existing resource facilities are used in an optimal fashion and also provide the framework for all future applications for new resource facilities, it is important that resource consolidation plans are finalized prior to the preparation of urban development plans.

The early completion of resource consolidation plans will ensure that non-essential resource sites will be eliminated and that any required resource sites will be protected during the exercise of preparing plans for urban development. In addition, the timely completion of resource plans will afford the proponents of urban development ample opportunity to address and resolve the potential conflicts stemming from the development lands in the vicinity of existing and proposed resource facilities. Given the merits of finalizing resource consolidation plans prior to undertaking the preparation of urban development plans, the Planning and Building Department will request resource operators, through the ERCB, to undertake the preparation of a resource consolidation plan following Council's authorization for the preparation of an Area Structure Plan (ASP). These resource plans should be completed prior to the adoption of ASPs.

2.0 DEVELOPMENT SETBACKS

In considering the matter of appropriate separation distance between resource facilities and urban development, the Board put forward recommendations for each of the following types of resource facility: well sites, battery sites, flowlines and transmission pipelines. In addition, the Board made recommendations regarding separation distances between institutional buildings and resource operations and also with regard to separation distances between well bores and public roadways. Each of the Board's recommendations regarding development setbacks is discussed below under separate heading.

2.1 Development Setbacks from Well Sites

With respect to well sites, the Board recommended a normal separation distance of 100 metres (328 feet) from a well stem to the nearest residence.[4] However, the Board also suggested that the recommended normal separation distance could be reduced to as little as 50 metres (164 feet) when extra measures such as special landscaping and the erection of suitable barriers to reduce visual impact and noise are undertaken. To avoid the excessive sterilization of developable land, the minimum separation distance will be applied within the City of Edmonton. Hence, special nuisance reduction measures must be undertaken in all instances. These special measures are discussed in greater detail in Section 4.0.

In order for the local approving authority to consistently apply the Board's recommended development setback between urban uses and well sites, the wording of the setback provision must be slightly modified to ensure clear understanding in all instances. As such, the City of Edmonton will apply the following setback requirement for development proposals in the vicinity of well sites:

> "Subject to conformance with the surface improvement requirements outlined in Section 4.0, the minimum separation distance between a well bore and the edge of the nearest developable parcel shall be 50 metres (164 feet)."

2.2 Development Setbacks from Batteries

The Board's recommendations pertaining to separation distances from battery sites are similar to those put forward for well sites with the exception that the critical reference point for battery sites is the edge of the lease area rather than any fixed facility on the lease. Specifically, the Board's recommendation is worded as follows: "The normal separation distance from the edge of a battery site to the nearest residence is 100 metres (328 feet) subject to it being reduced to as little as 50 metres (164 feet) when essential to accommodate urban development and where extra measures are taken (landscaping, noise reduction, and increased surveillance)."[5]

As is the case with well sites the minimum separation distance will be applied within the City of Edmonton, thereby necessitating implementation of the special measures discussed in Section 4.0. Once again, in an effort to remove any ambiguity, the City of Edmonton will apply the following setback requirement for development proposals in the vicinity of battery operations:

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4 Op cit 1 - page 45.
5 Ibid - Appendix III.

"Subject to conformance with the surface improvement requirements outlined in Section 4.0, the minimum separation distance between the edge of a battery lease and the edge of the nearest developable parcel shall be 50 metres (164 feet)."

2.3 Separation Distance from Flowlines

Flowlines are small diameter low pressure pipelines which transport petroleum liquids extracted from dispersed wells to centralized locations (batteries) for separation and storage. In addressing the matter of separation distances between flowlines and urban uses, the Board recommended a separation distance of 5 metres from the pipeline to the nearest building. As the location of a flowline within a right-of-way does not constitute a fixed reference point, there will be difficulty in implementing the intent of the Board's recommendations. To avoid implementation problems, the guideline must be modified by establishing a fixed reference point (i.e., edge of the right-of-way) as the operative location for determining the development setback. Accordingly, the City of Edmonton will apply the following guideline for development proposals in the vicinity of flowline alignments:

"The minimum separation distance between any flowline, or any other pipeline forming part of a pipeline collection system, and the nearest building shall be 2 metres (6.56 feet) from the edge of the flowline right-of-way."

2.4 Setback Distances from Transmission Pipelines

Although the West Edmonton Inquiry focussed on the co-existence of urban development and surface resource installations and minor pipeline networks linking those installations, the Board decided to provide some guidance regarding the separation distance between transmission pipelines and urban development. Specifically, the Board put forward the following recommendation in this regard:

"For public institutions, where people are dependant upon others for evacuation, such as hospitals, schools, or senior citizens homes the setbacks should be 200 metres (656.2 feet) from the centreline of:

a) any high vapour pressure (HVP) pipeline; or
b) any hydrocarbon pipeline with an outside diameter equal to or greater than 323.9 millimetres (12 inches) and an operating pressure equal to or greater than 3,475 KPA (500 psi)."

As the City will be dealing with this issue in a more comprehensive manner in a separate policy report entitled "The Integration of Transmission Pipelines and Urban Development", the City's various policy guidelines will be applied in reviewing urban development plans in the vicinity of transmission pipelines. Those proposing developments in areas constrained by the presence of transmission pipelines should consult the aforementioned report for policy direction in this regard.

2.5 Separation Distances Between Institutional Uses and Resource Operations

With the exception of special reference to the separation between specific institutional uses (hospitals, schools or senior homes) and transmission pipelines, the Board did not address the matter of appropriate separation distances between surface resource installations (well sites, batteries, satellite batteries) and institutional uses. The experiences of Long Beach, California in dealing with the integration of resource uses and urban development provide some insight in this regard.

In addressing the relative location of well sites to school sites and other institutional uses,[6] the community of Long Beach established a normal separation distance of 300 feet with a possibility of relaxing the separation distance to 200 feet subject to special mitigative measures regarding structural and sound proofing features being undertaken. Although the circumstances are not totally applicable to the Edmonton situation, the principle of establishing a special separation distance between selective institutional buildings[7], and resource sites seems appropriate.

As the separation distance applied in Long Beach pertains to the drilling of new wells in the vicinity of institutional buildings, not the locating of institutional buildings in the vicinity of existing resource operations, the structural and sound proofing measures outlined in the Oil Regulations for Long Beach are not applicable.

Noise levels in the vicinity of existing resource operations are significantly less the those associated with drilling a new well and/or the construction of new resource facilities. In the local situation the major issue is the safety of persons occupying institutional buildings. Accordingly, in the interest of public safety, the City of Edmonton will apply the following guideline in reviewing development proposals for institutional uses in the vicinity of resource operations:

> "No school or other institutional building where people are dependant on others for evacuation shall be located nearer than 100 metres (328.1 feet) from any well stem or battery lease. The 100 metre distance requirement may be reduced to a minimum of 60 metres (196.9 feet) if the proponent can demonstrate to the satisfaction of the ERCB, the City Fire Department and the City Emergency Planning Officer that adequate safety devices (high and low pressure shut downs, vapour recovery systems etc.) will be installed to reduce risk to an acceptable level."

Any proposed reduction of the separation distance below the normal 100 metres requirement must be accompanied by a detailed hazard analysis which must address the following matters:

> "Occupancy load within the institutional use, time required to evacuate the institutional building, probability for an injury causing accident, and the extent to which proposed safety features will reduce the probability of death or injury. The required hazard analysis will be prepared to the satisfaction of the City Fire Department and the City Emergency Planning Officer.

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6 'Other institutional uses' refers to public buildings where people are dependent upon others for evacuation (e.g., hospitals, nursing homes, day-care facilities, senior citizen housing, correctional institutions etc.)

7 Ibid

2.6 Separation of Public Roadways from Well Leases:

Section 2.110(b) of the Oil and Gas Conservation Regulation specifies that no new well shall be drilled at any point that is within 40 metres (131.2 feet) of a surveyed roadway or road allowance. In the past, the Board has allowed the relaxation of this requirement provided there were no safety concerns and with the consent of the local approving authority. In the situation where new roadway development is encroaching on existing well sites, it seems reasonable that an inverse policy position be established. Accordingly, the City of Edmonton will require that the normal separation distance between the edge of the right-of-way for new public roadways and an existing well bore be 40 metres (131.2 feet). This setback requirement may be relaxed following a review of the matter by the ERCB, the Planning and Building Department, the Transportation Department, and local safety officials including the Fire Department and the Emergency Planning Officer. A determination of appropriate separation distances between public roadways and existing well bores will be undertaken prior to finalizing roadway alignments at the subdivision stage.

3.0 URBAN DESIGN CONSIDERATIONS

In the exercise of incorporating resource operations within urban development plans a number of issues must be addressed and resolved. These include: the ultimate size of resource leases, the alignment of pipeline gathering networks, the future use of resource lands following the abandonment of resource operations, roadway design in areas constrained by the presence of resource operations, the treatment of lease areas and separation zones under plans of subdivision, and the future use and configuration of parcels created from lease areas following facility abandonment. These matters are addressed below.

3.1 Size of Resource Leases

The amount of land sterilized for development is dependent upon two factors: the size of resource leases and conformity with the setback provisions established by the Board.

Resource leases in the Edmonton area are typically uniform parcels with dimensions of 100 metres by 100 metres (328 feet x 328 feet) or 120 metres by 120 metres (394 feet x 394 feet). These dimensions result in resource leases which range in size from 1.0 hectare (2.47 acres) to 1.44 hectares (3.56 acres). Therefore, at first glance it appears that the amount of land sterilized for each resource lease is in the order of 1.2 hectares (3.0 acres). However, this excludes a consideration of the ramifications of the Board's development setback requirements.

In the case of well sites, the 50 metre (164 feet) separation distance is determined from the well bore. Therefore, the separation requirement can be effectively be accommodated within the confines of a typical 100 metre by 100 metre lease. However, as the separation requirement for battery sites is determined from the edge of the lease, conformity with the setback provision results in a potential increase in the sterilization effect of battery operations from 1.0 hectares (2.47 acres) to 4.0 hectares (9.88 acres). As such, any potential reduction in size of battery leases poses a significant benefit in terms of reducing the amount of land sterilized for development.

The size of battery leases is largely a function of the separation requirements for various on site facilities as established within the Oil and Gas Conservation Regulations. The most relevant requirements in this regard are summarized in Appendix 8. Board staff have indicated that battery leases can potentially be reduced to a minimum size of 40 metres by 120 metres if on site facilities are laid out in an optimal manner. Inclusive of the setback provision, this would result in a total sterilization of 3.08 hectares (7.61 acres), representing a substantial net gain in developable land.

As the downsizing of leases may result in the need to relocate on-site equipment to achieve a more optimal layout of battery facilities, there will be costs associated with such action. It is the Board's position that these costs would be the responsibility of the principal beneficiary. In the case of works required to reduce the size of battery leases, the main beneficiary is the developer and as such the developer is expected to bear the costs.

Given the significant impact that the size of resource leases poses on the developability of lands in the vicinity of resource sites, the determination of the ultimate size of surface leases constitutes a

matter that should be addressed early in the planning process. As such, it is recommended that the proponent commence negotiations with affected mineral owners/operators regarding the ultimate size of all surface leases during the Area Structure Plan preparation process. Further, it is important that all facility improvements, including associated costs and the timing of improvements, stemming from any proposed downsizing of resource leases also be addressed and resolved. These matters shall be resolved prior to Neighbourhood Structure Plan approval in the case of residential areas and prior to Area Structure Plan approval in the case of industrial areas.

3.2 Alignment of Flowlines

As multiple flowline alignments may substantially fragment potentially developable lands, the proponent should consider the costs and benefits of consolidating flowlines into a limited number of alignments or relocating flowlines to less intrusive locations such as along proposed boulevards, walkways, open space sites, etc. The rational siting of flowlines within an urban development plan may result in a significant increase in the yield of potentially developable land.

As the relocation of any existing flowlines will undoubtedly involve some costs to the developer, it is important that the matter of these costs and the timing of flowline relocation be determined at a stage of the planning process which will ensure effective implementation of any relocation works. Accordingly, the general alignment of all flowlines or any other pipeline forming part of a gathering system shall be finalized prior to Area Structure Plan approval (industrial areas), or prior to Neighbourhood Structure Plan approval (residential areas). The final alignment(s) of all flowlines shall be confirmed with the registration of a subdivision linen. Any proposed flowline relocation will be accommodated as a condition of subdivision approval.

3.3 Future Use of Resource Leases

Following the abandonment of resource operations, it is anticipated that all resource leases will be put to urban use. The future use of resource leases should be resolved in conjunction with the determination of use for surrounding lands in order to ensure that lease areas will ultimately be developed in a manner compatible with adjacent development. Accordingly, the Planning and Building Department will require a proponent to identify the future use of resource leases at the Area Structure Plan stage (industrial areas) or at the Neighbourhood Structure Plan stage (residential areas).

3.4 Access to Lease Sites

As there will be undoubtedly be occasional truck movements associated with the operation of resource facilities, direct access to all lease sites should be provided from roadways designed to accommodate heavy vehicle traffic. Accordingly, the detailed roadway design under Area Structure Plans and Neighbourhood Structure Plans should ensure that all resource leases are served by either arterial or major collector roads in accordance with the access guidelines of the City of Edmonton.

3.5 Treatment of Resource Leases Under Plans of Subdivision

Resource leases and any buffer lands required to conform to the Board's development setback provisions are not developable until such time that resource operations are abandoned. As such, resource lands should be legally isolated from surrounding developable lands. Accordingly, the City of Edmonton Municipal Planning Commission will require that resource lands, inclusive of any buffer zones, be created as separate consolidated parcels under a plan of subdivision. At the discretion of the Municipal Planning Commission, the Municipal reserves owing for resource parcels may be taken as a condition of subdivision approval or alternatively, reserves owing may be accommodated through a cash-in-lieu payment. Appendix 4 illustrates the treatment of resource parcels under plans of subdivision.

3.6 Tentative Plan for Lease Areas

As resource leases and any buffer lands will undoubtedly be developed following abandonment of resource operations, it is important that the future development of these lands be compatible with the character of surrounding development. Future developments on resource lands should be compatible with abutting development in terms of land use, parcel size, and parcel configuration. The matter of land use compatibility was discussed in Section 3.3. In order to ensure that the size and configuration of parcels created from lease lands are potentially compatible with adjacent development, the proponent shall provide a tentative subdivision design for lease lands in conjunction with an application to subdivide lands surrounding an existing resource site. Various examples of tentative subdivision designs for lease areas appear in Appendix 5.

4.0 SURFACE IMPROVEMENTS

In addition to giving due consideration to health and safety concerns, the successful co-existence of resource developments and urban uses is dependent upon implementation of surface improvements which will reduce the visual impacts of resource operations. The following sections put forward some guidance regarding surface improvements for both resource leases and flowline rights-of-way.

4.1 Surface Improvements for Lease Areas and Buffer Zones

There are a number of surface improvement actions which can effectively reduce the visual impacts of resource operations within an urban setting. These actions include: the selective planting of trees, shrubs, and flowers; the planting of appropriate ground cover; the construction of screen fencing around major resource equipment (pump jacks, storage tanks, incineration flares, separating equipment, etc.); the selective painting of resource equipment; the installation of appropriate hard landscaping around well heads, storage tanks, incinerator flares, etc.; the construction of appropriate on site parking facilities and access roads; and the installation of appropriate lighting.

To achieve optimal effectiveness, these actions must be undertaken as part of a comprehensive surface improvement strategy. Accordingly, as a condition of subdivision approval, the Municipal Planning Commission will require the preparation of a landscape plan for each resource site. All landscape plans shall be prepared by a qualified landscape architect. Each landscape plan must encompass the entire resource lease and any buffer lands. In addition, each plan must address all of the surface improvement actions discussed in the previous paragraph.

The preparation of landscaping plans for each resource site will be a requirement of the subdivision servicing agreement. Approval of the landscaping plans by the General Manager of the Planning and Building Department will be required prior to the City entering into a servicing agreement. The Planning and Building Department will review the details of landscaping plans with the affected resource companies prior to approval. In addition, the proponent will be required to file a performance bond or letter of credit with the City to ensure implementation of the surface improvements specified within an approved landscape plan.

The general criteria for the various components of a landscape plan are summarized in Appendix 6. In addition, an example of an acceptable landscape plan is illustrated in Appendix 7.

The landowner/developer will retain ongoing responsibility for maintaining landscape improvements.

4.2 Surface Improvements for Flowline Rights-of-Way

Flowline rights-of-way are linear easements which typically vary in width from 6.1 m (20 feet) to 9.1 m (30 feet). If appropriately landscaped, flowline rights-of-way can form an aesthetically pleasing and functional component of the open space system. Accordingly, as a condition of subdivision approval, the Municipal Planning Commission will require that proponents of subdivision plans for areas constrained by flowline alignments be required to submit a plan detailing the landscape improvements for each right-of-way. These plans must be prepared by a qualified landscape architect. As is the case for surface improvements on lease areas, the affected resource companies will be

consulted prior to plan approval. Once again, proponents will be required to post a performance bond or letter of credit for the amount required to complete the works specified in an approved plan.

5.0 OPERATING GUIDELINES

The preceding section puts forward guidelines pertaining to actions intended to reduce the visual impacts of resource operations in an urban setting. In addition, the Board's West Edmonton Inquiry Report put forward a number of recommendations intended to reduce other nuisance impacts such as noise and odour. Among others, these recommendations included: a requirement to replace gasoline engines with electric motors, a requirement for the installation of vapour recovery systems, and a prohibition of flaring except in emergency situations. Notwithstanding the fact that compliance with both the Board's guidelines and the City's surface improvement guidelines will ensure the reasonably successful co-existence of resource uses and urban development, a number of additional nuisance aspects associated with resource operations have not been adequately addressed. These include matters such as hours of operation for major construction activities and the impacts associated with truck movements. Guidelines regarding these matters are put forward below.

As these matters fall outside the City's mandate, the City will be requesting the ERCB's cooperation in implementing the following operating guidelines.

5.1 Piping of Petroleum Products

There are two means of transporting petroleum products from well sites: underground piping and tanker truck. As truck movements result in a number of negative impacts including: high noise levels, earthborn vibrations, increased dust levels and higher probability for accidents, it is desirable to reduce truck movements to the greatest extent possible, especially in residential areas. As such, underground piping constitutes the most desirable means of removing petroleum products from well sites. Accordingly, the Planning and Building Department will request the ERCB to encourage the removal of petroleum liquids from well sites located in urban areas by underground pipeline wherever possible.

5.2 Hours of Trucking Operations

As mentioned previously, truck movements pose a number of negative impacts on adjacent urban uses, especially in residential communities. To minimize these nuisance impacts, truck movements should be limited to day time hours. Accordingly, the Planning and Building Department will request the ERCB to limit the hours of trucking operations in those situations where it is necessary to remove petroleum products from a well site located in a commercial or residential district by tanker truck. Specifically, the Department will suggest the following guideline to the Board: with the exception of cases of emergency, truck movements should be limited to the day time hours of 7:01 hours to 20:00 hours, Monday through Saturday, excluding legal holidays.

5.3 Hours of Operation for Major Construction Activity

As major resource construction activity such as drilling operations, well workovers, and major equipment repair and maintenance may be highly disruptive within an urban setting, it is desirable to limit the hours of operation for such activities. Accordingly, the Planning and Building Department will request the ERCB to limit non-emergency major construction activities on lease sites within a built-up area to the day time hours of 7:01 hours to 20:00 hours, Monday through Saturday, excluding legal holidays.

5.4 Flaring Operations

The combustion of gases at the top of flare stacks, 6.1 metres (20 feet) to 9.1 metres (30 feet) in height, constitutes the typical means of disposing of unwanted solution gases. Given the undesirable effects of flaring operations in an urban setting, the Board has recommended that no continuous flaring be permitted on lease sites within an urban area. Nonetheless, the nature of resource operations requires that emergency flare equipment be present on most leases. Given the undesirable impacts of stack flaring even on an occasional basis, stack type flare equipment should be avoided if possible. Incineration type flare equipment provides an opportunity to avoid the use of stack flares. Incineration flares are substantially lower in profile and combustion occurs in a closed chamber. Accordingly, through the use of incineration flares, the impacts of emergency flaring can be substantially reduced. As such, the Planning and Building Department will request the ERCB to promote the use of incineration type flaring equipment for purposes of emergency flaring within urban areas.

6.0 SUBMISSION & CIRCULATION REQUIREMENTS

The successful co-existence of resource operations and urban development requires substantial dialogue and co-operation among all affected parties. To ensure that the planning process provides ample opportunity for the proper resolution of concerns related to the integration of resource operations and urban development, the Planning and Building Department will initiate a number of changes to the application requirements and the plan review and circulation processes currently in effect. These recommended changes are discussed in the following sections.

6.1 Information Requirements

As the successful integration of resource operations and urban development must start with an understanding of the nature of existing resource operations, the Planning and Building Department will require that a proponent for urban development provide the following information in conjunction with ASP, NSP and subdivision applications:

- the name and address of all resource companies operating within the plan area; and,
- particulars regarding existing resource operations including matters such as the size of lease, equipment on site, the expected operating life of the resource facilities, and the nature of current operations.

The assembling of this information provides three advantages. First, development proponents will be required to establish initial contact with resource operators[8]. This will provide the impetus for on-going dialogue between the developer and resource operator - an essential element in developing mutually acceptable integration solutions. Secondly, through assembling this information, the developer will be in a position to prepare superior strategies for integrating resource operations within his or her development plan. Finally, the provision of additional information regarding resource operations will aid the City in rendering more informed decisions on development plans[9] for areas constrained by the presence of resource operations.

6.2 Circulation of Plans

It is important that all affected parties have an opportunity to review a development plan and record their comments prior to the Municipal Planning Commission's or City Council's consideration of the proposal. As such, the Planning and Building Department will ensure that all development plans[10] for areas in the vicinity of resource operations are circulated to all affected resource companies, the Energy Resources Conservation Board and any other relevant agency for review and comment.

Policy 6.3 requires that the proponent submit sufficient copies of the application to facilitate this expanded circulation.

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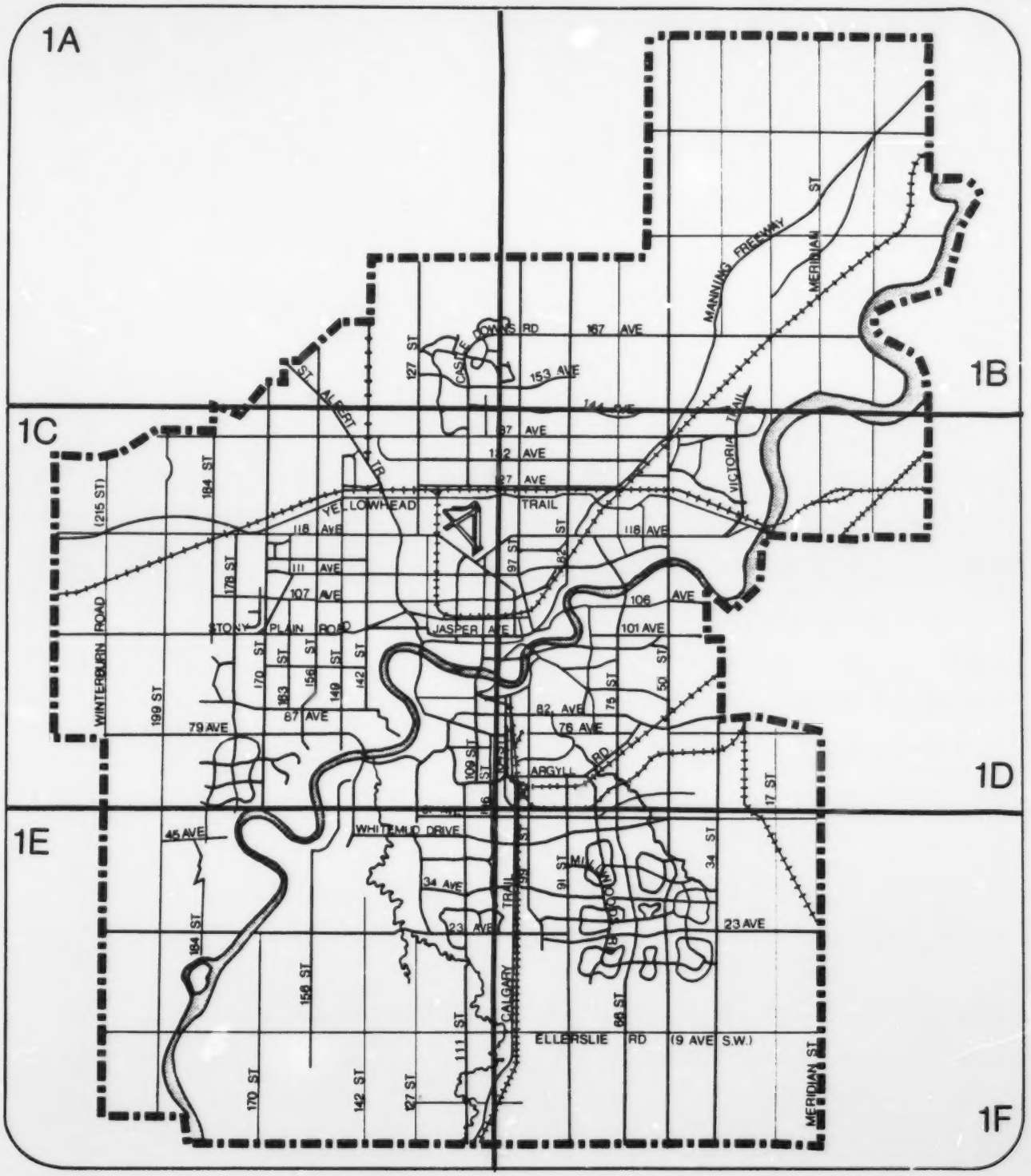
8 To assist developers with initiating contact with resource operators, Appendix 9 lists the names, addresses, and contact personnel for all resource companies operating in the Edmonton Area.

9. In this context 'development plans' refers to ASP, NSP and subdivision submissions.

10. Ibid.

MAP ILLUSTRATING RESOURCE OPERATIONS
WITHIN THE CITY OF EDMONTON



INDEX

N

PLANNING AND BUILDING

LEGEND

A1.2

LOCATION

DRILLING

COMPLETED PRODUCING OIL D2

COMPLETED PRODUCING OIL D3

COMPLETED PRODUCING OIL LOWER CRETACEOUS

COMPLETED PRODUCING OIL CARDIUM

COMPLETED PRODUCING GAS

POTENTIAL GAS WELL

PREVIOUSLY PRODUCED OIL D2 NOW SALT WATER DISPOSAL WELL

ABANDONED

ABANDONED-LOWER CRETACEOUS OIL WELL, PREVIOUSLY GAS WELL

WASTE DISPOSAL WELL

PREVIOUSLY PRODUCED VIKING SANDSTONE NOW ABANDONED

PREVIOUSLY PRODUCED D2 NOW ABANDONED

OIL WELL-LOWER CRETACEOUS,PREVIOUSLY GAS WELL

DAUL OIL WELL-NISKU D2 AND LOWER CRETACEOUS

GAS WELL-PREVIOUSLY LOWER CRETACEOUS OIL WELL

SALT WATER DISPOSAL WELL-PREVIOUSLY LOWER CRETACEOUS OIL WELL

SALT WATER DISPOSAL WELL-PREVIOUSLY GAS WELL

SALT WATER DISPOSAL WELL

ABANDONED SALT WATER DISPOSAL WELL, PREVIOUSLY D2 OIL WELL

OIL WELL-LOWER CRETACEOUS,PREVIOUSLY
LOWER CRETACEOUS AND NISKU D2 DAUL OIL WELL

DAUL WELL-LEDUC D3 OIL AND SALT WATER DISPOSAL WELL

ABANDONED-LOWER CRETACEOUS OIL WELL

WATER INJECTION WELL

SALT WATER DISPOSAL WELL-PREVIOUSLY BELLY RIVER OIL WELL

ABANDONED,PREVIOUSLY GAS WELL

ABANDONED,PREVIOUSLY POTENTIAL GAS WELL

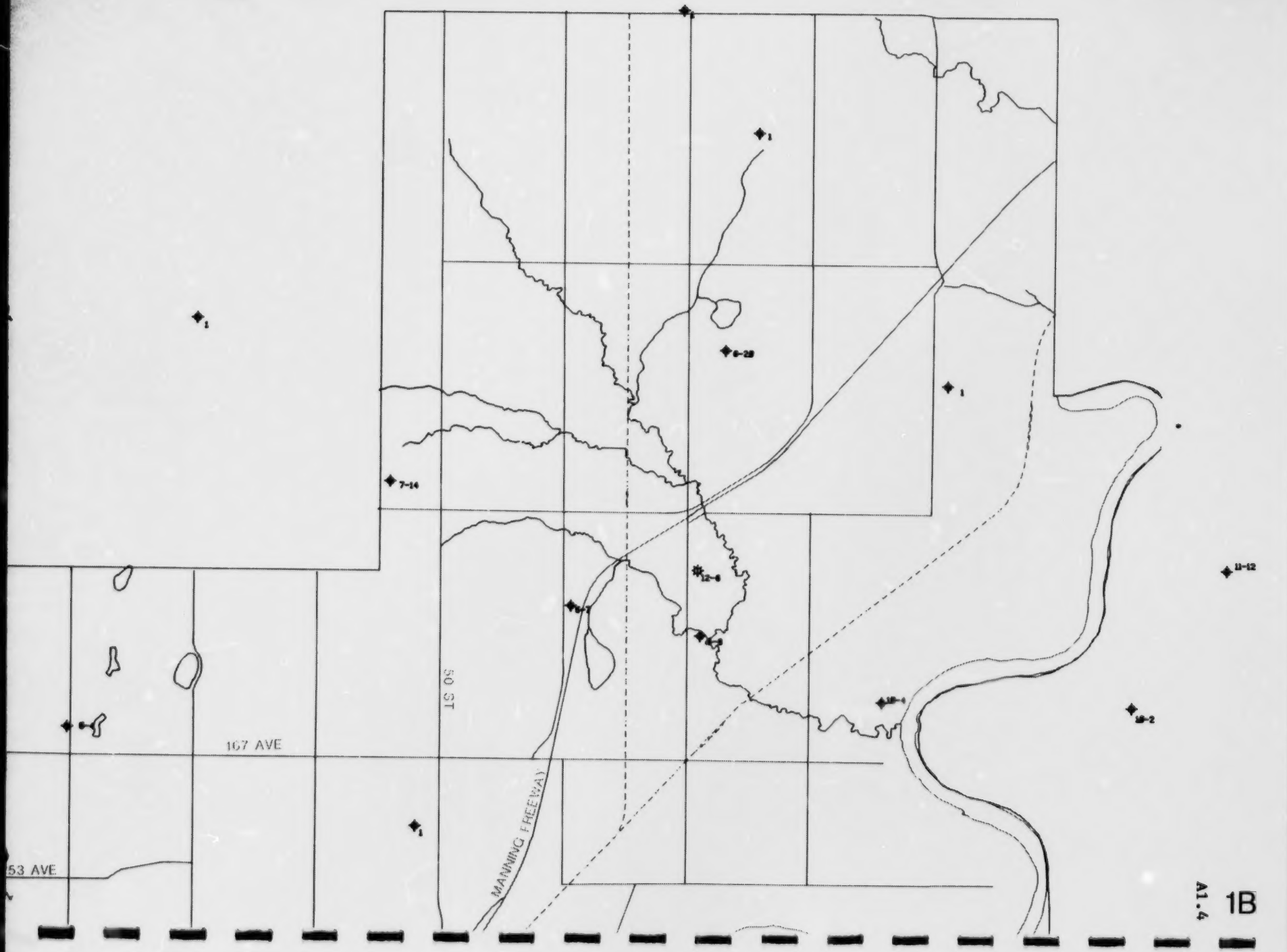
ABANDONED,PREVIOUSLY SALT WATER DISPOAL

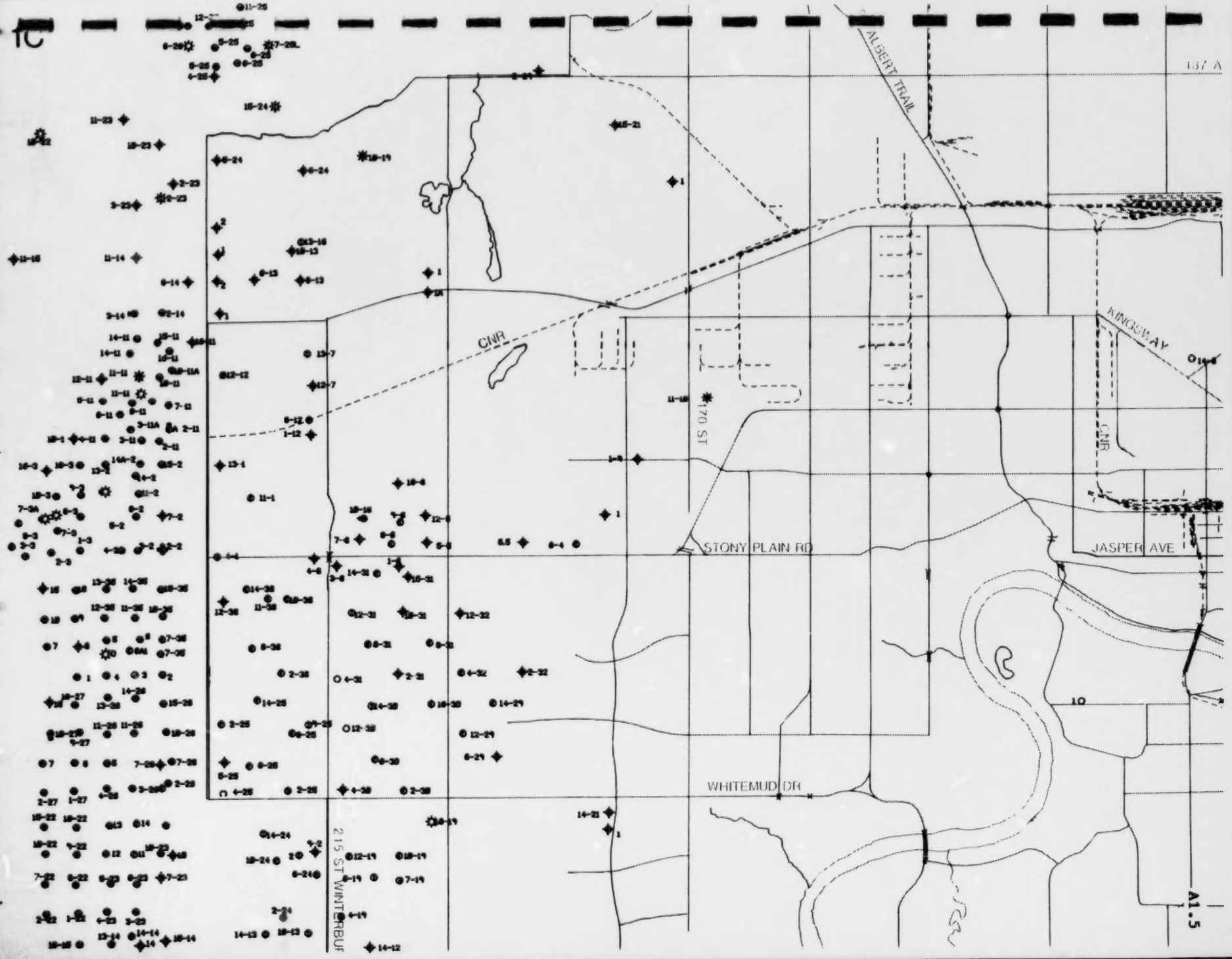
GAS INJECTION WELL

OIL WELL-MISSISSIPPIAN

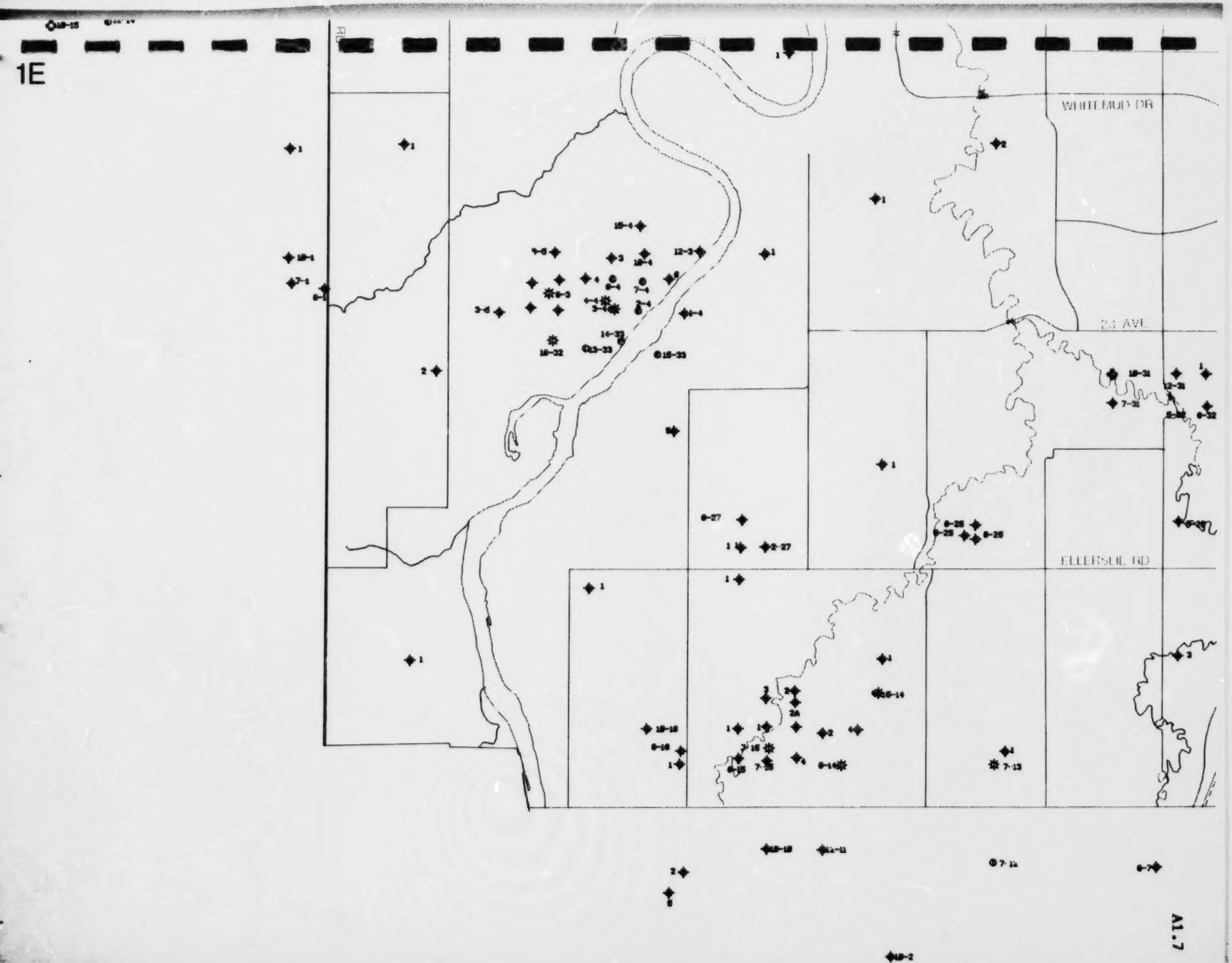
OIL WELL-WABAMUN D1

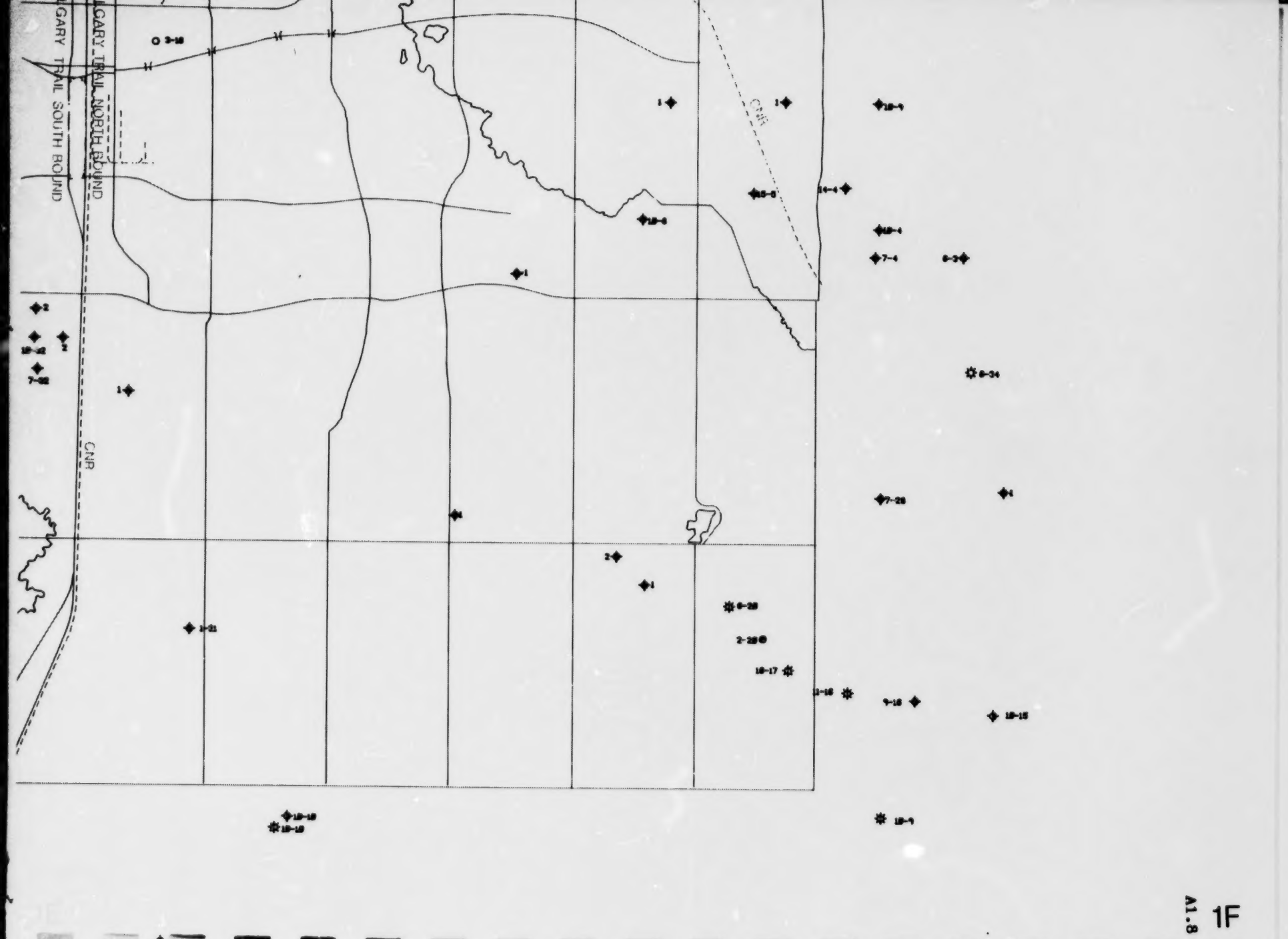
1A


50 ST
167 AVE
153 AVE
MANNING FREEWAY
A1.4
1B


ALBERT TRAIL
137 A
CNR
170 ST
KINGSWAY
CNR
STONY PLAIN RD
JASPER AVE
WHITEMUD DR
215 ST WINTERBUR
A1.5

82 ST
FORT ROAD
YELLOWHEAD TR
CNR
118 AVE
CAMILANO DR
RIVER
SASK
NORTH
75 ST
50 ST
WHYTE AVE
ARGYLL RD
CPR
A1.6
1D


1E
WHITEMUD DR
23 AVE
ELLERSLIE RD
A1.7


CALGARY TRAIL NORTH BOUND
CALGARY TRAIL SOUTH BOUND
CNR
CNR

A1.8 1F

SUMMARY OF THE ENERGY RESOURCES CONSERVATION BOARD'S RECOMMENDATIONS

Appendix 2

DECISION AND RECOMMENDATIONS

Decision

The Board finds that there are substantial oil reserves underlying the inquiry area and that it is in the public interest to recover as much of the reserves as practical. It also expects that the area will experience considerable urban development prior to abandonment of the oil operations.

The Board thus believes that co-existence of oil operations and urban developments will be necessary, primarily in Area 4 as shown on Figure 2, and that such can be accomplished in a reasonable manner.

Board Action

The Board will put into practice the various requirements set out in this report and in accordance with the timing spelt out in section 7.9. It does not see the need for major changes in the existing Oil and Gas Conservation Regulations. Most of the matters, for example, the reduction the setback distances from facilities and markers for abandoned pipelines, can be handled under existing provisions.

The Board recognizes the growing problems in marketing solution gas on a voluntary basis in the inquiry area and elsewhere in the province. It will ask the Government for legislative authority to require the compulsory purchase of solution gas in situations such as West Edmonton.

Recommendations to Other Jurisdictions

The Board recommends that the City of Edmonton and other planning authorities allow co-existent development in Area 4 of the inquiry area, and put into action the various requirements suggested in this report for the area. It makes the following specific recommendations:

(a) Establish a standard 100-metre setback from a residential, commercial, or industrial development to a well, battery, or satellite, with provision for reducing the setback to 50 metres upon compliance with the conditions outlined in the report.

(b) Establish a 5-metre setback from a residential, commercial, or industrial development to a pipeline, except for certain public insitutions and certain pipelines, where a 200-metre setback should prevail.

(c) Ensure that the developers incorporate the existing resource facilities into the urban infrastructure at an early stage of planning.

(d) Require the establishment of a high-level committee to ensure integration of resource and urban plans and to ensure proper notification to prospective new home buyers.

(e) Consider ways of recognizing lands sterilized as a result of the application of separation requirements, as part of the required urban reserve.

(f) Consider the possibility of caveatting or registering existing and abandoned resource facilities on land titles.

Other Recommendations

The Board strongly urges a high degree of co-operation among the resource and urban development companies and all approving or regulating authorities, so that co-existent development can proceed with the minimum of problems.

DATED at Calgary, Alberta, this 8th day of July, 1983.

G. J. DeSorcy
Vice Chairman

MEASURES TO REDUCE PROBLEMS OF CO-EXISTENCE

With respect to the south-central portion of the inquiry area, the Board does not consider that the existence of oil facilities in close proximity to high density residential developments would create a serious public safety problem. Nuisance problems, such as odours and noises, would exist and to minimize these the Board believes the following listed measures are necessary. Where the Board has jurisdiction, it will implement the suggestions and, it recommends the adoption by other jurisdictions of the remaining measures.

1 A high degree of co-operation amongst mineral owners.

2 The consolidation of batteries to the maximum practical extent and the replacement of small batteries with satellite batteries where feasible.

3 The installation of additional gas processing capacity so that solution gas can be conserved and the remaining producing life shortened. The Board believes that expansion of the existing ICG plant would be the most appropriate manner in which to increase capacity.

4 If markets for the solution gas cannot be voluntarily achieved, legislative changes should be made that would allow the Board to direct that purchasers take, on a priority basis, gas produced with the oil.

5 A high level of communication and co-operation between the energy industry and landowners and developers to ensure co-ordinated planning.

6 The formation of a liaison committee made up of representatives of the City of Edmonton, Edmonton Metropolitan Regional Planning Commission, and the Energy Resources Conservation Board, to co-ordinate planning in the area.

7 The recognition and incorporation of existing and planned energy facilities into urban plans for the area.

8 A program, including a printed brochure, to make residents and prospective residents of the area aware of the existence of the oil facilities, and to familiarize them with the problems that may be expected.

9 The following special requirements with respect to wells:

(a) the drilling of all new wells as soon as possible,

(b) the directional drilling from existing well sites of essentially all new wells,

(c) the precise locating of all abandoned wells, and when necessary, their re-abandonment to lower the depth of the casing relative to the ground,

(d) particular care during workovers to minimize nuisance problems, and prior notification to the Board and residents of the area before proceeding with workovers,

(e) a normal separation distance of 100 metres from a well to residences, subject to it being reduced to as little as 50 metres when extra measures are taken,

(f) equipping all wells with high and low pressure shutdown devices,

(g) equipping pumping wells with electric-drive motors and production blowout prevention devices,

(h) minimizing of lease equipment, and prohibition of permanent flaring facilities,

(i) proper securing of well sites with fences and locked gates, good housekeeping practices and regular painting, and the posting of signs giving 24-hour emergency telephone numbers,

(j) prohibition of trucking of oil and salt water, and

(k) for those wells with a separation distance of less than 100 metres, special landscaping and the erection of suitable barriers to reduce visual impact and noise.

10 The following special requirements with respect to pipelines:

(a) the precise locating and marking of abandoned pipelines,
(b) the removal from the ground of portions of abandoned pipelines where essential to urban development,
(c) a separation distance of 5 metres from any pipeline to any building except certain public institutions where the separation would be 200 metres under certain circumstances,
(d) special precautions, such as temporary fencing, to avoid third-party damage during periods of residential construction,
(e) consolidation of existing pipelines to the maximum practical extent and use of corridors for future pipelines, and
(f) installation of automatic shut-down devices at appropriate locations.

11 The following special requirements with respect to batteries:

(a) a separation distance from the edge of a battery site to residences of 100 metres, subject to it being reduced to as little as 50 metres when essential to accommodate urban development and where extra measures are taken (landscaping, noise reduction, and increased surveillance),
(b) conservation of gas from all sources including storage tanks,
(c) minimized use of surface land through effective planning,
(d) suitable landscaping and housing of equipment to the maximum practical extent,
(e) proper securing of battery sites with fences and locked gates, good housekeeping practices and regular painting, and the posting of signs giving 24-hour emergency telephone numbers, and
(f) prohibition of flaring except in emergency situations.

12 A separation distance of 40 metres from oil facilities to public roadways, provided that the distance can be reduced when agreed to by municipal authorities.

The Board believes that all special measures should be implemented at the earliest logical time, but in any case, at least prior to the time at which residential development is within 500 metres of oil facilities.

FINANCIAL RESPONSIBILITY FOR SPECIAL MEASURES

The Board generally believes that the oil industry should bear responsibility for all expenditures related to on-lease measures that would be necessary where facilities are located 100 metres or more from residences. Where the separation distance is reduced, the developers should pay for the extra measures.

It is the Board's view that relocation of existing facilities to accommodate residential developments should be paid for by the developers or under a negotiated sharing agreement. The proper locating of future facilities should be the responsibility of the oil operators.

The oil industry, as is normally the case, would carry the cost of on-lease sterilized land, but the cost of such land off-lease should be the financial responsibility of the developers.

GLOSSARY OF TERMS

GLOSSARY OF TERMS

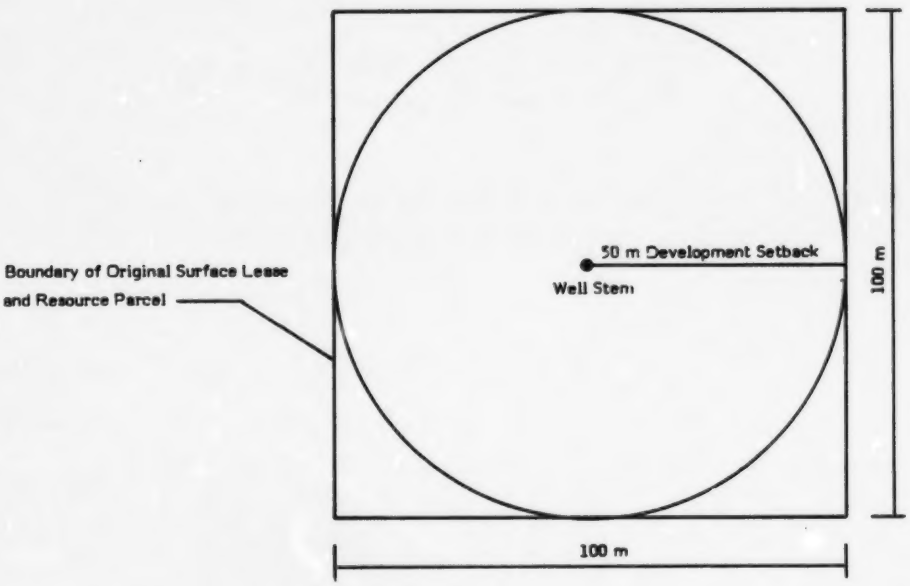
Abandonment	"Abandonment" means the cessation of operations at a well or battery site and the removal of all equipment and restoration of the lease area in accordance with the requirements of the Energy Resource Conservation Board and the Department of Environment.
Area Structure Plan	"Area Structure Plan" means a plan which provides the framework for the development of an area of land in a municipality by describing: the land used proposed for the area, the sequence of development proposed for the area, the density of population proposed for the area, and the general location of major transportation routes and public utilities.
Battery	"Battery" means tanks and other surface equipment designed to receive and separate oil, gas and water produced from one or more wells.
Blowout	"Blowout" means the uncontrolled discharge of gas, liquids or solids (or a mixture thereof) from a well into the atmosphere.
Blowout Preventer	"Blowout Preventer" means a mechanical, hydraulic, pneumatic or other device or combinations of such devices secured to the top of a well casing which are designed and capable of preventing a blowout.
Development Officer	"Development Officer" means a person or persons appointed as a development officer pursuant to the Edmonton Land Use Bylaw.
Drill or Drilling	"Drill or Drilling" means to bore a hole in the earth for purpose of completing a well.
Gas	"Gas" means the gaseous components or vapours contained or derived from petroleum or natural gas.
Maintenance Operations	"Maintenance Operations" means the repair and replacement of parts of a structure where such action does not alter or lessen the character, strength, or stability of the structure.
Mineral Rights	"Mineral Rights" means the right of ownership of mineral deposits below the earth's surface.
Municipal Planning Commission	"Municipal Planning Commission" means the local development review and approval body established by Council pursuant to the provisions of The Planning Act, RSA 1980, as amended.
Neighbourhood Structure Plan	"Neighbourhood Structure Plan" means an intermediary plan which details the form and pattern of development regarding land use, density of development, and roadway alignments for purposes of providing the framework for subsequent subdivision and development of a specified area of land in a municipality.

Oil	"Oil" means and includes petroleum, and "petroleum" means and includes oil.
Operator	"Operator" means the person, whether proprietor, lessee, or individual contractor, actually in charge and in control of the installation, maintenance and operation of a well or battery.
Outer Edge Or Outer Boundary Line	"Outer Edge" means the exterior limit of the lands included within the surface lease for a resource operation.
Petroleum	"Petroleum" means and includes any and all hydrocarbon substances found in a natural state, including but not limited to crude oil, natural gas, natural gasoline and other related substances.
Resource Operation	"Resource Operations" means and includes all activities in connection with the exploration and drilling for petroleum and production of petroleum, including secondary and tertiary operations, together with the operation of all equipment and appurtenances incident to such activities.
Surface Lease	"Surface Lease" means a property right granting surface access with respect to which a lessee enjoys the right to develop and produce petroleum resources for a determinable period.
Tank	"Tank" means a structure used in conjunction with either the drilling or production of a well used for holding or storing liquids associated with drilling or producing operations.
Well	"Well" means any hold drilled into the earth for the purpose of exploring or producing oil or gas including those holes used for the purpose of injecting fluids or gas for stimulating oil or gas recovery or those holes used for the disposition of oilfield waste fluids.
Workovers or Well Servicing	"Workovers" means work performed on a well after its initiate completion to repair downhole equipment or to increase production rates.

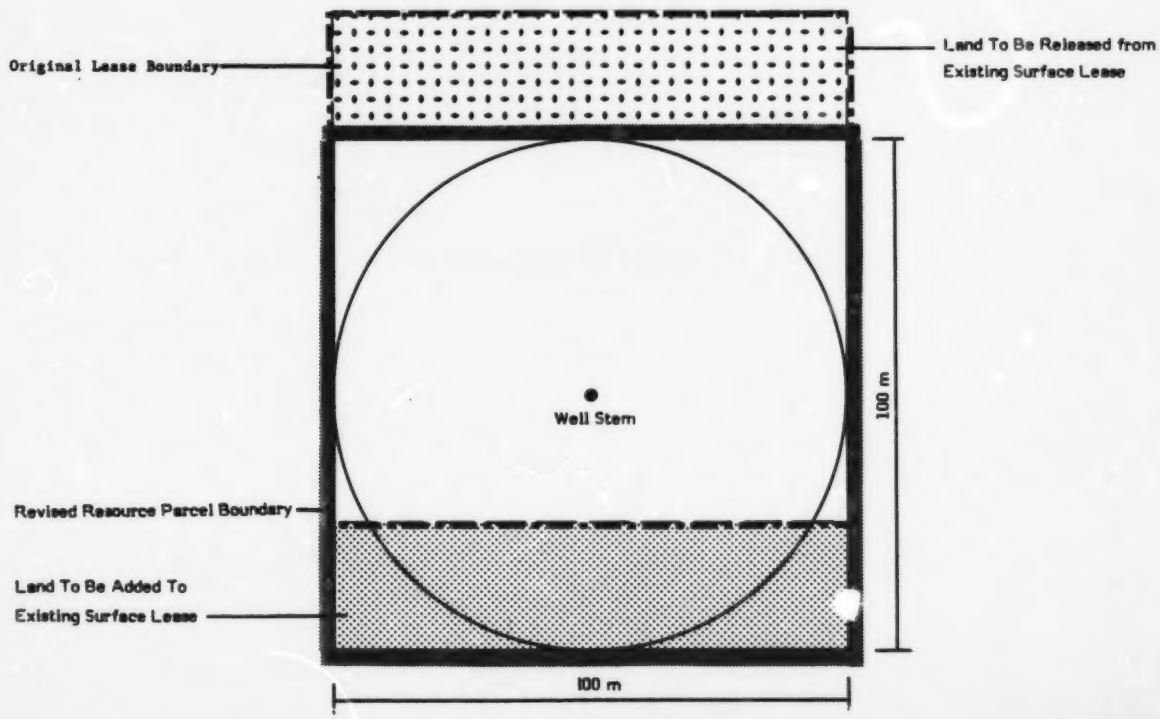
ILLUSTRATION OF THE RECOMMENDED TREATMENT OF RESOURCE SITES UNDER PLANS OF SUBDIVISION

Appendix 4

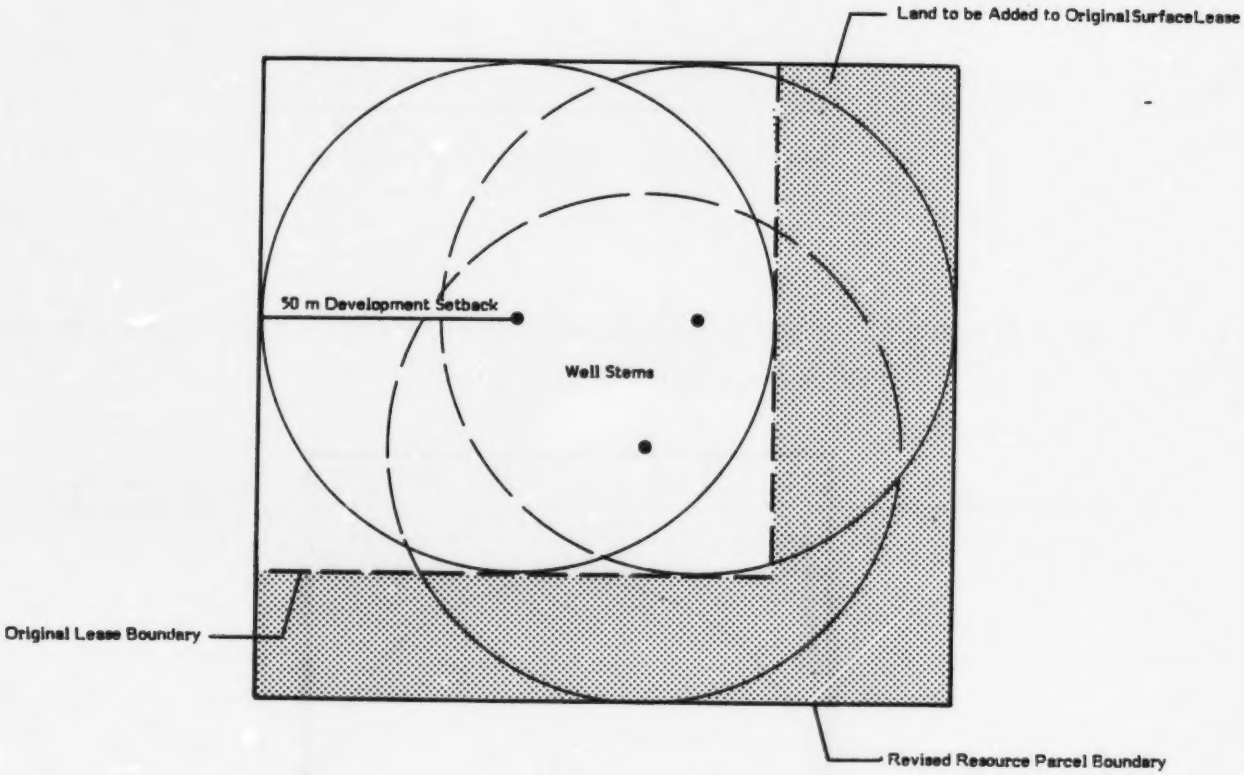
METHOD FOR DELIMITING THE BOUNDARY OF A SURFACE LEASE (Resource Parcel) WITH A SINGLE CENTRALLY LOCATED WELL



METHOD FOR REDEFINING THE BOUNDARY OF A SURFACE LEASE (Resource Parcel) FOR A WELL SITE WITH AN OFF-CENTRE WELL



METHOD FOR REDEFINING A SURFACE LEASE (Resource Parcel) FOR A WELL SITE WITH MULTIPLE WELLS


Land to be Added to Original Surface Lease
50 m Development Setback
Well Stems
Original Lease Boundary
Revised Resource Parcel Boundary

DELINEATION OF A RESOURCE PARCEL BOUNDARY FOR A BATTERY SITE WITH NO EQUIPMENT RELOCATION

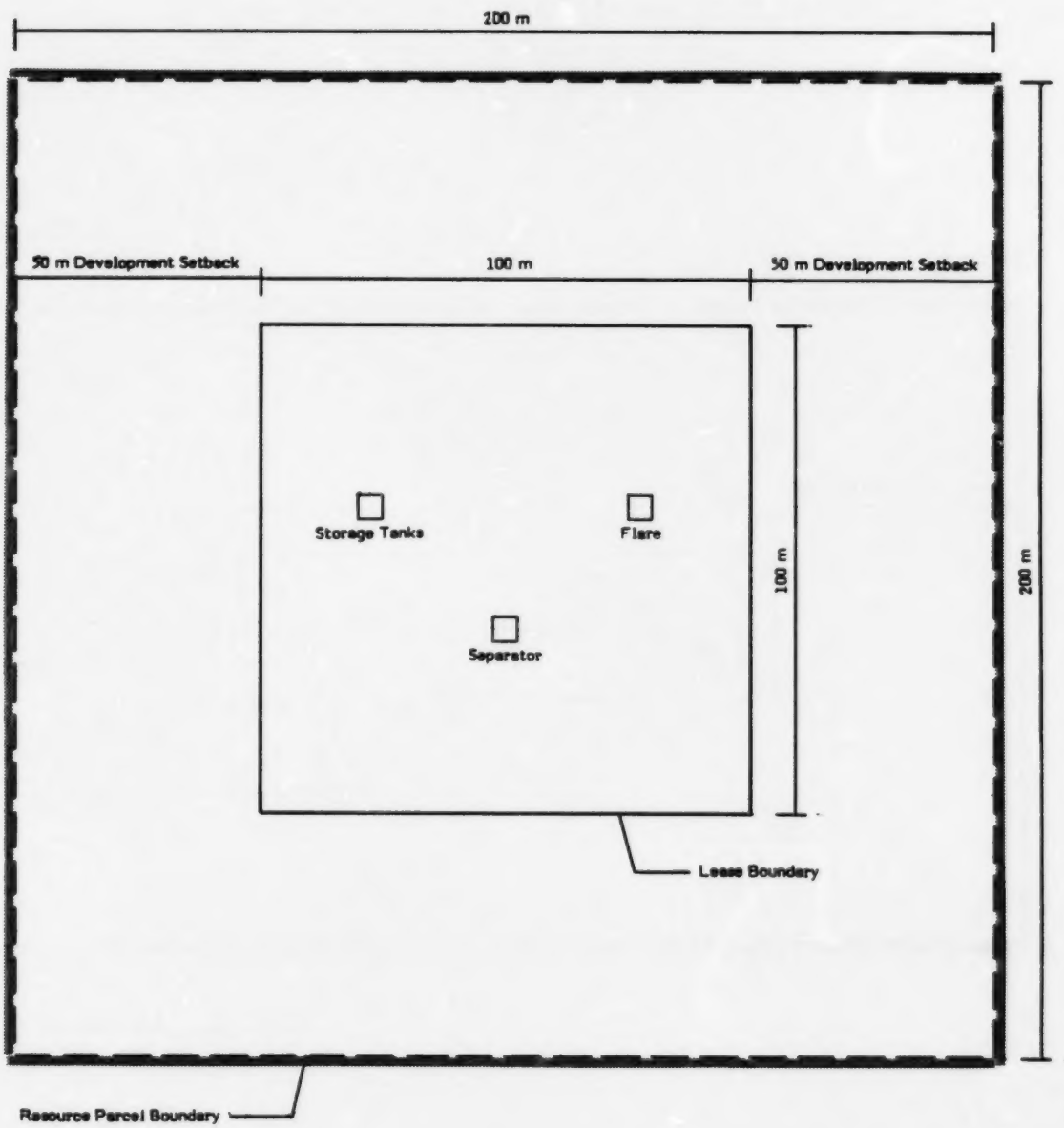


ILLUSTRATION OF MINIMUM BATTERY SURFACE LEASE (Without Well) AND CONCOMMITANT RESOURCE PARCEL

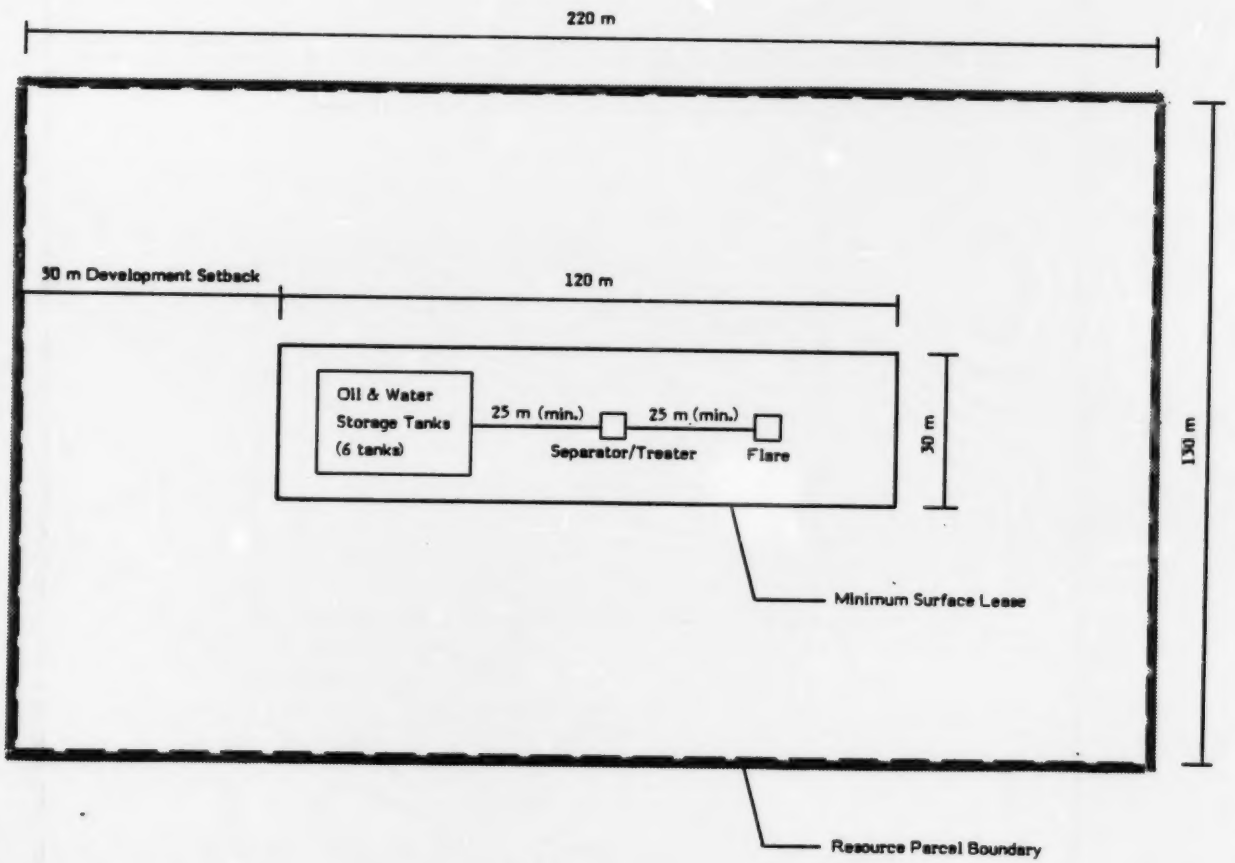


ILLUSTRATION OF MINIMUM BATTERY LEASE (With Well) AND CONCOMMITANT RESOURCE PARCEL BOUNDARY

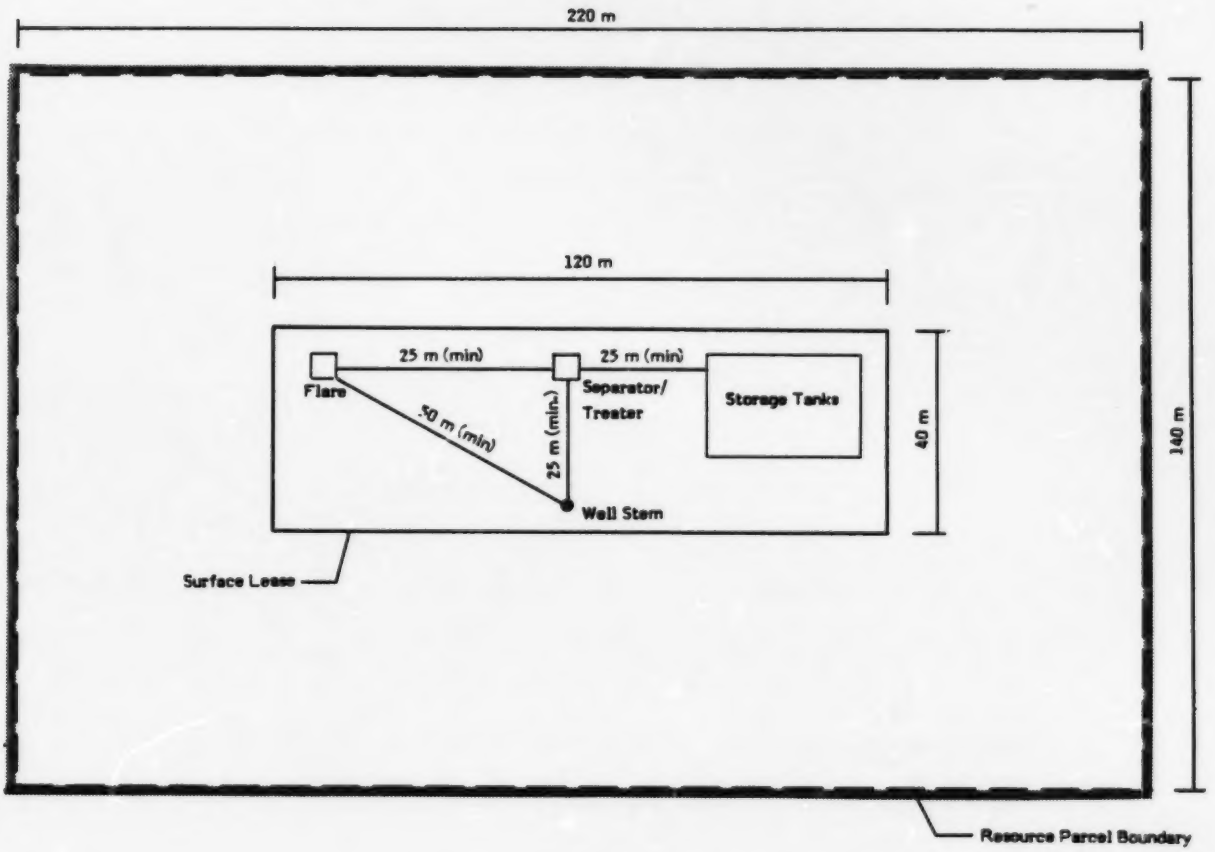
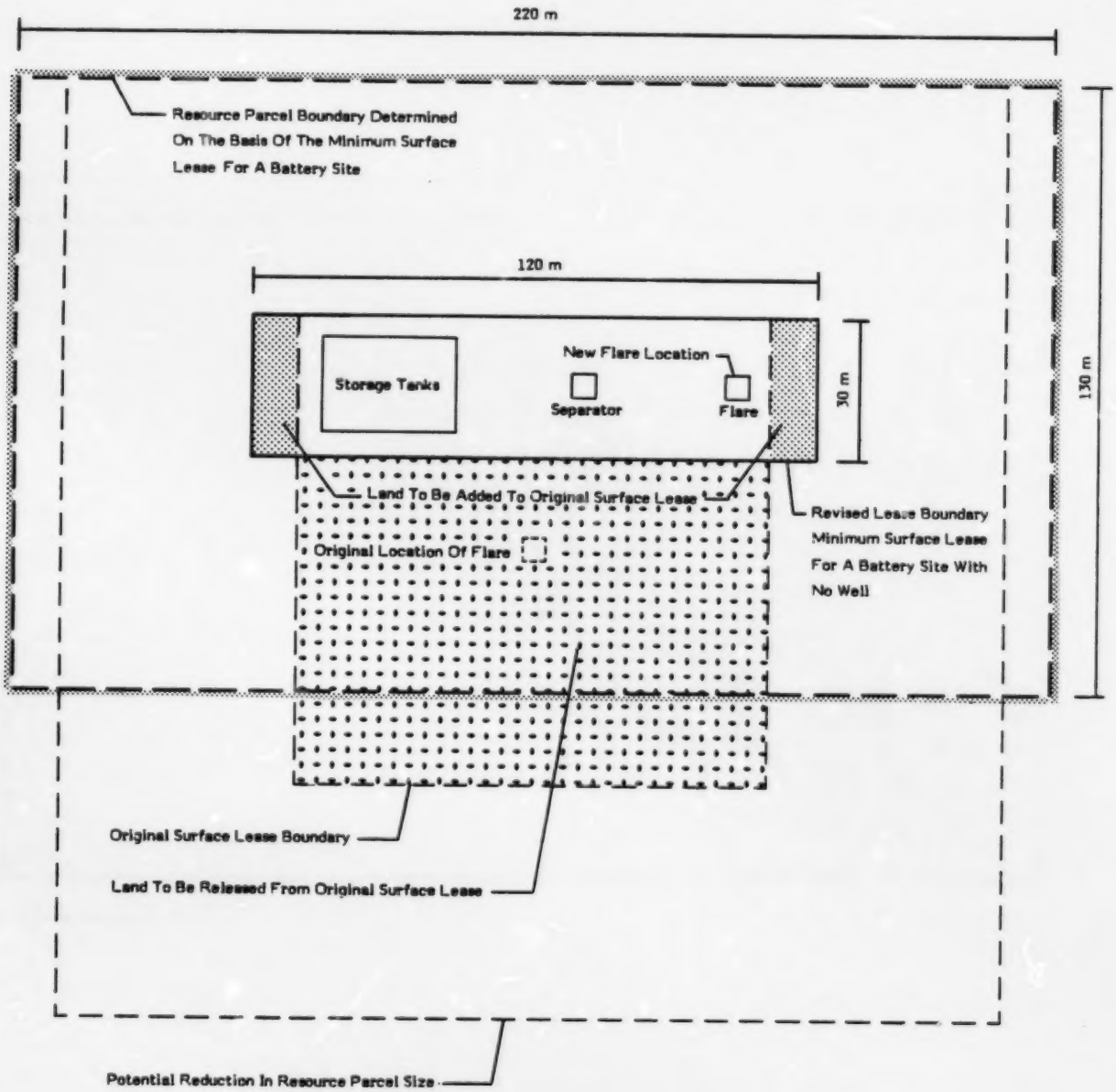
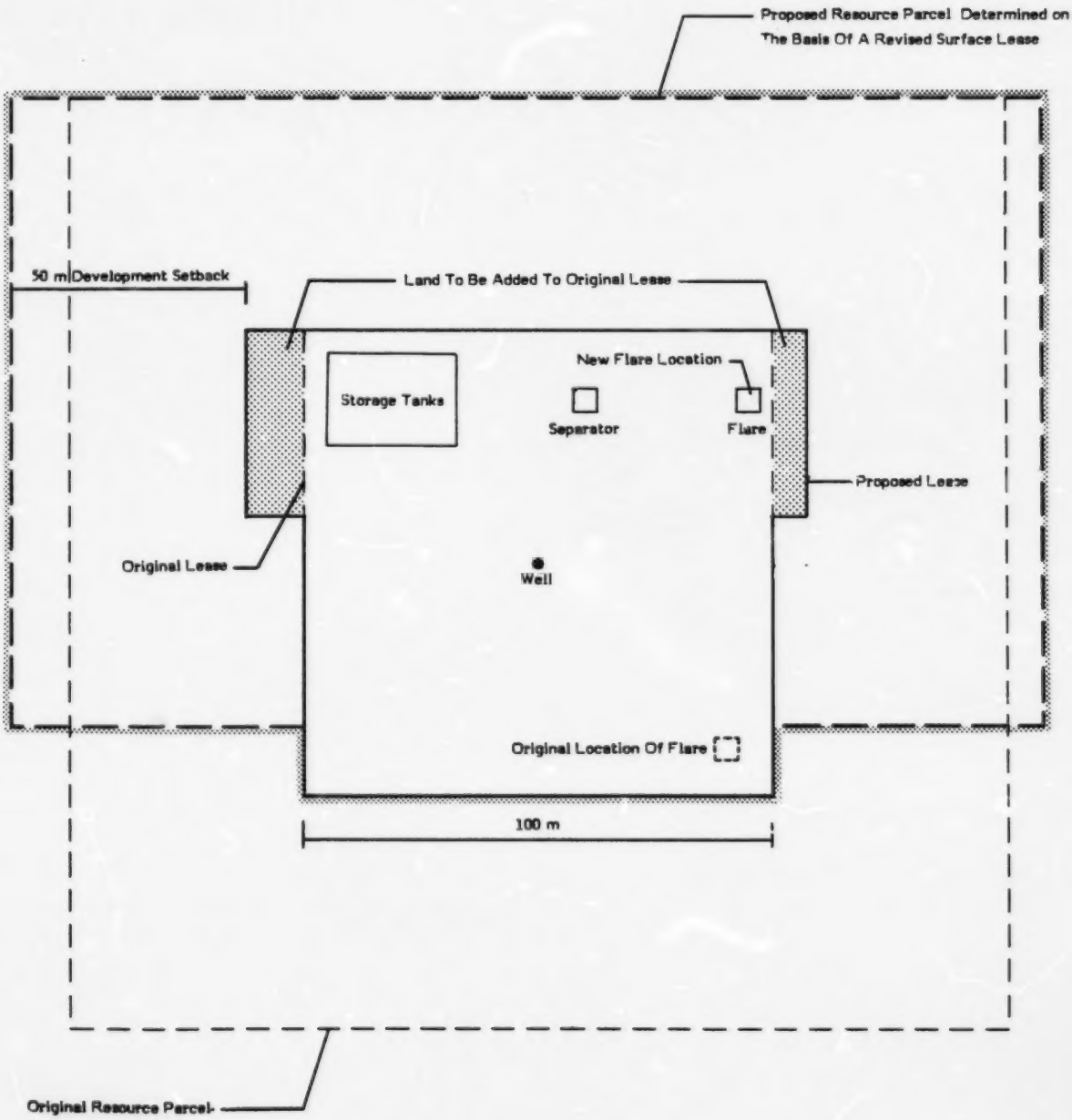


ILLUSTRATION OF POTENTIAL REDUCTION IN RESOURCE PARCEL SIZE WITH EQUIPMENT RELOCATION (Battery Site With No Well)


220 m
Resource Parcel Boundary Determined On The Basis Of The Minimum Surface Lease For A Battery Site
120 m
Storage Tanks
New Flare Location
Separator
Flare
30 m
130 m
Land To Be Added To Original Surface Lease
Original Location Of Flare
Revised Lease Boundary Minimum Surface Lease For A Battery Site With No Well
Original Surface Lease Boundary
Land To Be Released From Original Surface Lease
Potential Reduction In Resource Parcel Size

Note: Relocation of flare required to reduce resource parcel size

ILLUSTRATION OF POTENTIAL REDUCTION IN RESOURCE PARCEL SIZE WITH EQUIPMENT RELOCATION (Battery Site With Well)

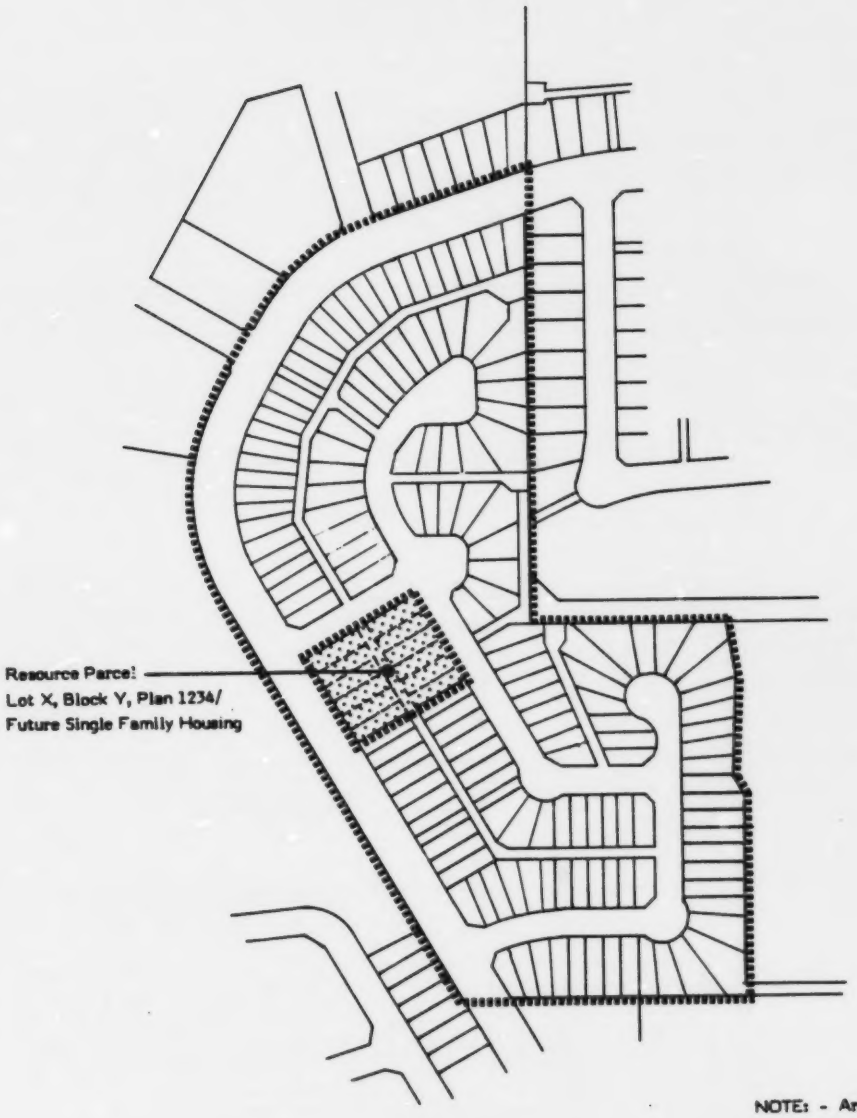


Note: Relocation of flare required to reduce resource parcel size

EXAMPLES OF TENTATIVE PLANS OF SUBDIVISION FOR RESOURCE SITES

Appendix 5

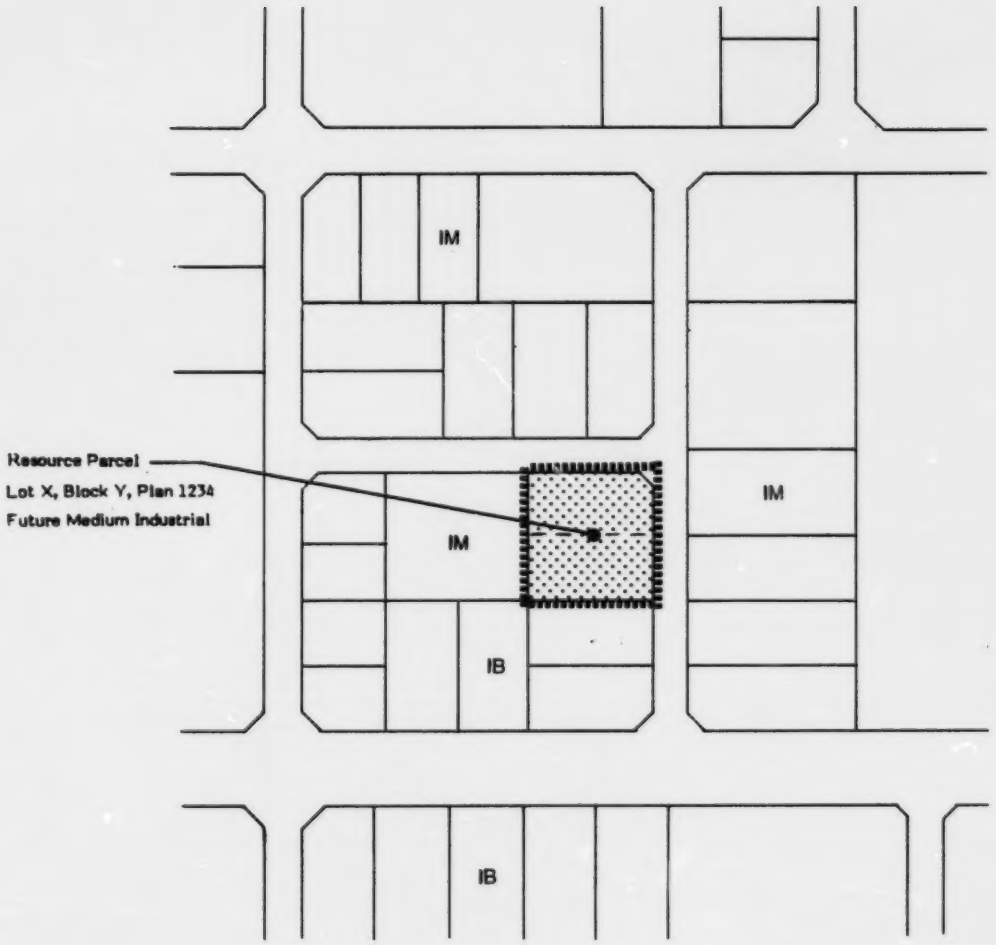
EXAMPLE OF INCORPORATING A RESOURCE PARCEL WITHIN A RESIDENTIAL SUBDIVISION



NOTE: - Arterial access to resource parcel

- Resource parcel includes both surface lease and setback requirement

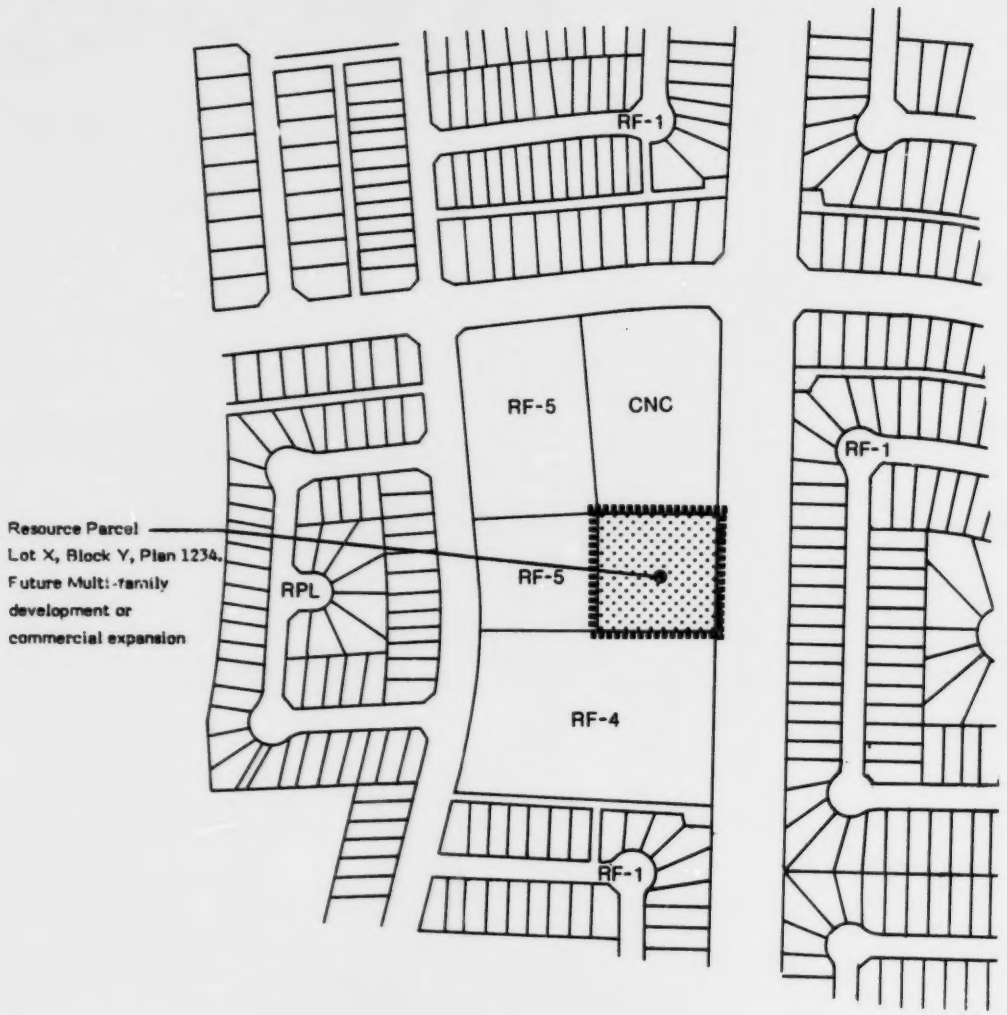
EXAMPLE OF INCORPORATING A RESOURCE PARCEL WITHIN AN INDUSTRIAL SUBDIVISION



Note: - Arterial access not essential as all roadways in an industrial subdivision are constructed to a standard which will accommodate heavy vehicle movements

- Resource parcel includes both surface lease and setback requirement

EXAMPLE OF INCORPORATING A RESOURCE PARCEL ADJACENT TO A COMMERCIAL SITE



Note: - Arterial access to resource parcel

- Resource parcel includes both surface lease and setback requirement

GUIDELINES FOR SURFACE IMPROVEMENTS

Appendix 6

GUIDELINES FOR SURFACE IMPROVEMENTS

Vegetative Cover

- All planting material selected shall be hardy to the Edmonton Region, and to the location on the site where they are planted. The Alberta Horticultural Guide shall be used as a reference in selecting plants.
- As a minimum, the number of trees shall be determined on the basis of one tree for each 46 m^2 (495.1 sq. ft) of resource lease parcel not enclosed by screen fencing.
- All trees planted shall be at least 4.5 cm (1.75 in) caliper for deciduous trees, and at least 2 m (6.6 ft) in height for evergreen trees.
- The proportion of deciduous trees to evergreen trees shall be approximately 60:40.
- Three shrubs shall be planted for each tree.
- Vegetation shall be planted in such a manner so as to minimize the visual impacts of resource operations.
- With the exception of the portions of the lease parcel enclosed within screen fencing, or forming planting beds for trees, shrubs, or flowers, or completed with hard surface improvements, the entire site shall be seeded in grass.

Screen Fencing

- With the exception of resource equipment contained within buildings, screen fencing shall be constructed around all resource equipment (pump jacks, tanks, incinerator flares, etc.).
- All buildings not enclosed or completely screened (e.g., treater buildings or separator buildings), shall be clad in materials compatible with the appearance of surrounding development.
- In the case of enclosures for storage tanks, the screen fencing shall be constructed on top of small earth berms which are in place for purposes of spill retention.
- Screen fencing shall be constructed around resource equipment in such a manner so as to permit adequate working space for normal maintenance and inspection activities.
- Screen fencing shall be between 1.83 m (6 ft) and 2.44 m (8 ft) in height.
- Screen fencing shall be constructed of solid wood or solid masonary walls or alternative materials equally as effective in concealing resource operators and equally compatible with the appearance of surrounding development.

- In addition to concealing resource operations, screen fencing must be capable of providing a high level of site security by precluding unauthorized access.

- Screen fencing shall be constructed in such a manner so as the fence is portable; that is, easily removed and replaced in order to facilitate major construction/maintenance activities such as reworking of wells.

Hard Surface Improvements

- All access roads and parking and turning surfaces on resource leases shall be constructed of asphalt or other hard surface materials to a standard capable of accommodating heavy equipment and vehicles.

- Each resource lease shall contain surface parking for three vehicles and a turning surface adequate to accommodate the turning movements of a tanker truck or emergency response vehicles.

- All surfaces enclosed within screen fencing shall be covered with materials which control dust, mud and noxious weeds (e.g., 19 mm minus gravel or 19 mm crushed stone or similar surface material).

Painting of Resource Equipment

- All resource equipment shall be painted in such a manner so as to complement adjacent development to the greatest extent possible. In developing a painting scheme, there are two general approaches which can be followed. The first approach is to soften the visual impact of resource equipment by using colours which blend into the surrounding environment. In this case, the use of a combination of pastel colours is most appropriate. The second approach is to capitalize on the industrial aesthetic afforded by the shapes of resource equipment. In this case, the use of bold, bright colours in combination is most appropriate. The former approach is generally more suitable in residential areas whereas the latter approach may provide substantial opportunities to enhance the visual image of commercial or industrial areas.

Lighting of Sites

- For purposes of surveillance, all resource sites shall be well lit with outdoor lighting which is located and arranged in such a manner that no direct rays of light are directed at any adjoining property, or interfere with the effectiveness of any traffic control device.

Signage

- All enclosed areas containing resource equipment shall have warning signs placed in prominent locations on the screen fencing. The warning signs shall include the following information: name of resource company, telephone number for resource company, an emergency response telephone listing, and statement prohibiting unauthorized access.

- All neighbourhood information signs shall clearly indicate the location of resource facilities within the area.

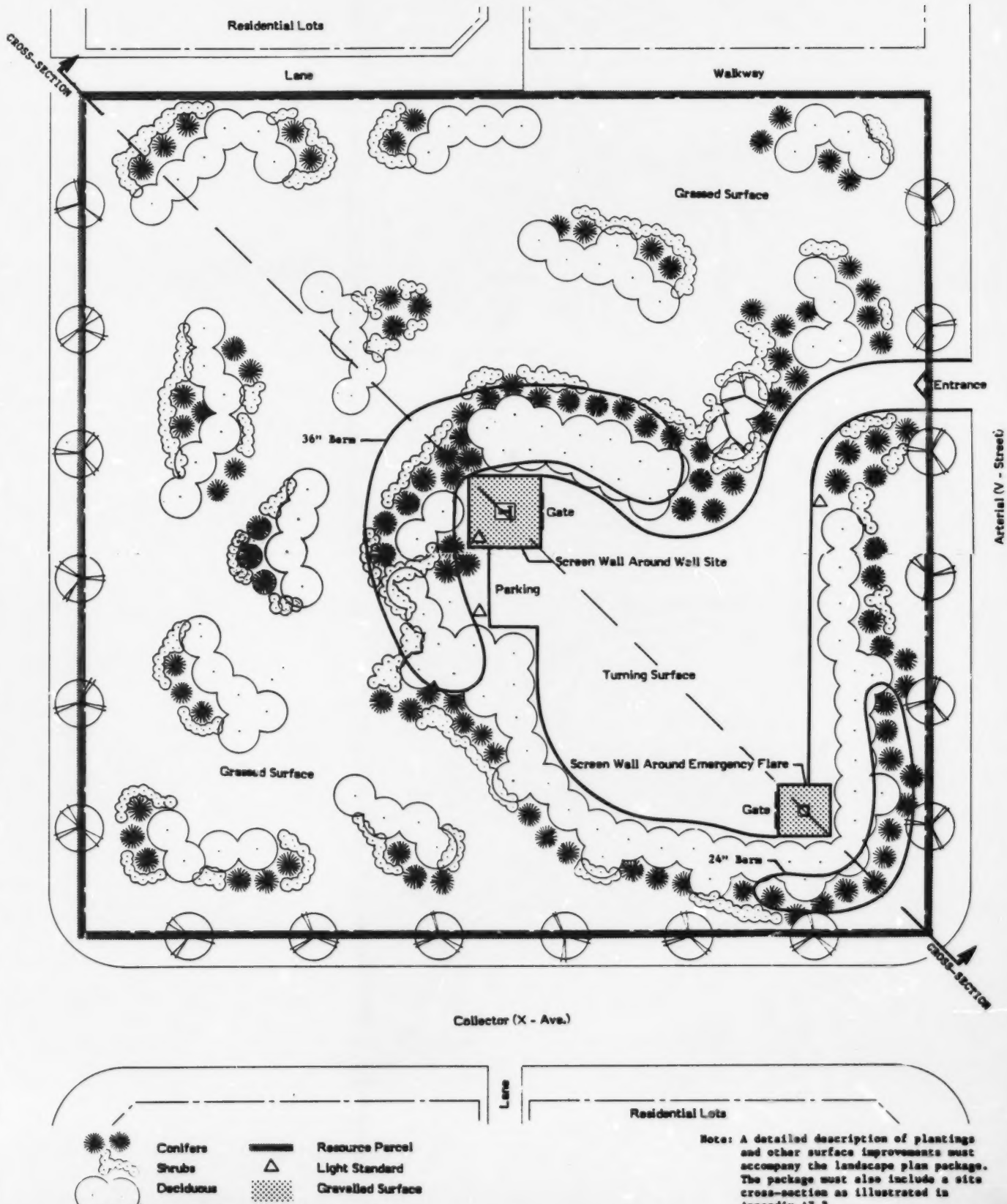
Surface Drainage

- Direct drainage of resource sites to the storm sewer system will not be permitted and storm water shall be contained totally within

the site for evaporation or for slow and controlled discharge to the sanitary sewer system if capacity is available. The surface drainage design for resource parcels shall be to the satisfaction of the City's Water and Sanitation Department.

EXAMPLE OF A LANDSCAPE PLAN

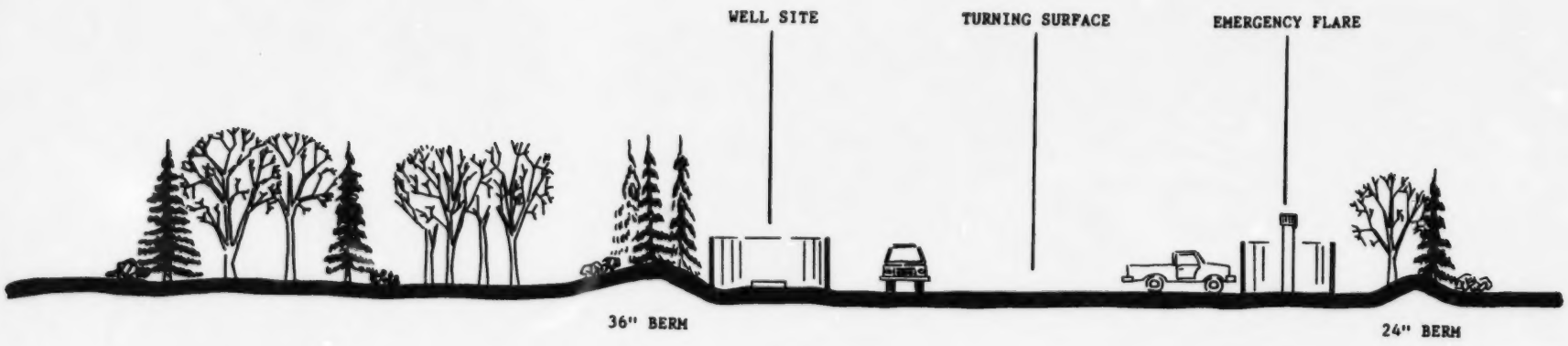
EXAMPLE OF A LANDSCAPE PLAN



* Selected species must be identified.

Note: A detailed description of plantings and other surface improvements must accompany the landscape plan package. The package must also include a site cross-section as illustrated in Appendix A7.2

LANDSCAPE PLAN CROSS-SECTION



A7.2

SUMMARY OF RELEVANT SECTIONS OF THE OIL AND GAS CONSERVATION REGULATIONS

Appendix 8

Posting of Licence and Signs

6.010 (1) During drilling operations, the licensee shall post and keep prominently displayed at the well site the duplicate of the licence for the well, together with the duplicate of any amendment thereof.

(2) The licensee of a well shall

(a) mark the well, upon completion, with a conspicuous sign bearing the name of the well and, if it is not indicated by the well name, the legal description of its location, and

(b) maintain the sign in a satisfactory condition until the well is abandoned.

6.020 Whenever drilling or servicing operations are being carried out on a well at which there is a reasonable expectation of encountering gas containing hydrogen sulphide, the licensee shall post or cause to be posted suitable signs on or near the rig warning of the presence of poisonous gas.

Storage

8.010 No oil shall be stored in pits.

8.020 (1) No crude bitumen or hydrocarbon derived therefrom shall be stored in a pit without the written approval of the Board.

(2) Where pit storage is approved under subsection (1), the operator shall not commence or continue to use pit storage until the Board or its authorized representative has approved the pit and any necessary fencing or protective installation.

8.030 (1) Each tank or group of tanks containing oil or any fluid other than fresh water at a battery or processing plant shall be surrounded by a dike or firewall of a net capacity greater than that of the largest tank within the dike or firewall, or such greater capacity as the Board may in any case require, and the dike or firewall shall be maintained in good condition and the dike or firewall and the area encompassed by it kept free from grass, weeds or other extraneous combustible material, but the Board may suspend any requirement of this subsection in a particular case.

(2) Each oil tank or battery of tanks at a well, production battery or processing plant shall be located so that the distance from the outer perimeter of the dike to any surface improvement other than a public roadway is not less than 60 metres.

(3) Notwithstanding subsection (2), the Board, where in its opinion special circumstances exist, may permit the location of tanks closer to any surface improvement than the distance therein prescribed.

(AR 151/71; AR 341/74; AR 229/79)

Burning Vented Gas

8.080 (1) The licensee of a well or the operator of an oil sands scheme shall burn any significant volume of gas that is vented to the atmosphere.

(2) The licensee shall construct and safeguard all flare pits and ends of flare line so that no hazard to public property and forest cover will be created and so that they are not located closer than 100 metres to a surface improvement, except a surveyed roadway, but the Board where, in its opinion, special circumstances exist, may prescribe a greater or lesser distance.

(3) No flare pit or open end of a flare line shall be placed or remain within 50 metres of a well or oil storage tank, or within 25 metres of any oil or gas processing equipment, but the Board, having regard to the volume and nature of the gas and the flash point and other characteristics of the oil being produced, may suspend the application in a field or pool of the requirement herein respecting the distance of a flare pit or open end of a flare line from a well and in such case, notwithstanding subsection (1), gas vented from the flare line shall not be burned.

(AR 151/71; AR 295/78)

Fired Equipment and Engine Exhausts

8.090 (1) In this section

(a) "fire" means any unprotected flame or source of ignition;

(b) "flame type equipment" means any electric or fired heating equipment using an open flame, electric arc or element and includes a space heater, torch, heated process vessel, boiler, electric arc or open flame welder, or an open element electric heater or appliance;

(c) "process vessel" means a heater, dehydrator, separator, treater or any vessel used in the processing or treatment of produced gas or oil.

(2) No person shall create or cause to be created any fire within 50 metres of a well, oil storage tank or other source of ignitable vapour.

(3) No oil storage tank shall be placed or remain within 50 metres of any well, but the Board may prescribe a distance of less than 50 metres but not less than 15 metres in any field or at any well, having regard to the products of the well.

(4) No flame type equipment shall be placed or operated within 25 metres of a well, oil storage tank, or other source of ignitable vapour, except

(a) where the well is

(i) a water supply well, or

(ii) a water injection well equipped with a suitable packer and with the surface casing annulus vented outside any building,

or

(b) that emergency work requiring the use of flame type equipment may be conducted within 25 metres of a well, if the wellhead valves and the blow-out preventer, if one is installed, are closed, or

Use of Condensate

8.110 (1) Where the licensee or operator of a well uses condensate or other low flash point hydrocarbons in an operation at the well other than in the hydraulic fracturing of a formation, he shall observe the following rules:

1. no open tanks shall be used for storing or gauging or measuring the pumping rate;

2. a minimum distance of 50 metres shall be maintained between the wellhead and storage tank;

3. positive shut-off valves shall be installed between the tank and pump and between the pump and wellhead;

4. a check valve shall be installed between the pump and the well to prevent back flow from the well;

5. all surface lines downstream from the pump shall be pressure tested to 10 000 kilopascals above anticipated maximum pressure to be encountered;

6. no significant wastage shall occur.

(2) Condensate or other low flash point hydrocarbons shall not be blended with propping agents for the purpose of hydraulically fracturing a formation, but the Board may, on application, approve a given fracturing program if conclusive evidence is submitted to show that there is not another carrying fluid available that will be similarly effective.

(AR 151/71; AR 69/72; AR 295/78)

Smoking

8.120 (1) No person shall smoke within 25 metres of a well, separator, oil storage tank or other unprotected source of ignitable vapour or on a rig or derrick at a well site.

(2) Each licensee of a well and each contractor who has contracted to manage or perform any operation at a well shall enforce the provisions of subsection (1) at the well.

(3) Where a person smokes within 25 metres of a well or on, or within 25 metres of, a rig, derrick, separator, oil storage tank or other unprotected source of ignitable vapour at a well site,

(a) the person so smoking is guilty of a contravention of subsection (1), and

(b) a contractor who is the employer of the person so smoking and the licensee of the well each is guilty of a contravention of subsection (2) regardless of whether he had knowledge of the smoking and regardless of whether he had taken any steps to guard against smoking.

(AR 151/71; AR 295/78)

LIST OF RESOURCE COMPANIES OPERATING FACILITIES WITHIN THE CITY OF EDMONTON

BARNELL OF CANADA
#800, 639 - 5th Avenue SW
CALGARY, Alberta
T2P 0M9
Ph. (403) 263-5953

BLUESKY OIL & GAS LTD.
7th Floor
333 - 5th Avenue SW
CALGARY, Alberta
T2P 3B6
Ph. (403) 263-0690

CAMEL OIL & GAS LTD.
#1701, 300 - 5th Avenue SW
CALGARY, Alberta
T2P 3C4
Ph. (403) 264-0777

CANADA GEOTHERMAL OIL LTD.
Box 6240, Station D
#1730, 717 - 7th Avenue SW
CALGARY, Alberta
T2P 0Z3
Ph. (403) 262-4572

CANADA NORTHWEST ENERGY LTD.
2800 One Calgary Place
330 - Fifth Avenue S.W.
CALGARY, Alberta
T2P 0L4
Ph. (403) 364-0291

CANADA SOUTHERN PETROLEUM LTD.
505 - 8th Avenue SW
CALGARY, Alberta
T2P 1G2
Ph. (403) 269-7741

CANOGA EXPLORATION LIMITED
Box 101
9945 - 108 Street
Petroleum Plaza
NORTH EDMONTON, Alberta
T5K 2G6
Ph. (403) 246-1666

CHEVRON CANADA RESOURCES LIMITED
500 - 5th Avenue SW
CALGARY, Alberta
T2P 0L7
Ph. (403) 234-5000

DENISON MINES LIMITED
#1500, 444 - 5th Avenue SW
CALGARY, Alberta
T2P 2T8
Ph. (403) 269-4327

DOME PETROLEUM LIMITED
333 - 7th Avenue SW
CALGARY, Alberta
T2P 2Z1
Ph. (403) 231-3000

DRUMMOND PETROLEUM LTD.
#2100, 425 - 1st Street SW
CALGARY, Alberta
T2P 3L8
Ph. (403) 269-8850

ESSO RESOURCES
237 - 4th Avenue SW
CALGARY, Alberta
T2P 0H6
Ph. (403) 237-3737

GLENORA RESOURCES LTD.
#907, 1333 - 8th Street SW
CALGARY, Alberta
T2R 1M6
Ph. (403) 228-5577

KELVIN ENERGY LTD.
#1830, 801 - 6 Avenue SW
CALGARY, Alberta
T2P 3W2
Ph. (403) 263-3171

LEDDY EXPLORATION LIMITED
#905, 610 - 8th Avenue SW
CALGARY, Alberta
T2P 1G5
Ph. (403) 264-3557

LEGAL OIL & GAS LTD.
P.O. Box 8100
Station F
EDMONTON, Alberta
T6H 4N9
Ph. (403) 435-4744

MUTUAL OIL & GAS LTD.
#1800, 500 - 4 Avenue SW
CALGARY, Alberta
T2P 2V6
Ph. (403) 265-6033

NORCEN ENERGY RESOURCES LIMITED
#202, 4712 - 13 Street NE
CALGARY, Alberta
T2E 6P1
Ph. (403) 231-0111

NORTH CANADIAN OILS LIMITED
10th Foor, Bradie Building
630 - 6th Avenue SW
CALGARY, Alberta
T2P 0S8
Ph. (403) 262-3951

PETRO-CANADA/PETRO-CANADA INC.
P.O. Box 2844
150 - 6 Avenue SW
CALGARY, Alberta
T2P 3E3
Ph. (403) 296-8000

PLACID OIL COMPANY
727 - 7 Avenue S W CALGARY, Alberta
T2P 0Z5
Ph. (403) 263-4310

RANGER OIL LIMITED
#2700, 425 - 1st Street SW
CALGARY, Alberta
T2P 3L8
Ph. (403) 263-1500

SUNCOR INC.
500 - 4th Avenue SW
CALGARY, Alberta
T2P 0J6
Ph. (403) 269-8100

SCURRY-RAINBOW OIL LIMITED
2300 Home Oil Tower
324 - 8th Avenue SW
CALGARY, Alberta
T2P 2Z5
Ph. (403) 232-7101

TRICENTROL OILS LIMITED
#2900, 425 - 1st Street SW
CALGARY, Alberta
T2P 3L8
Ph. (403) 264-3333

TRI-STAR RESOURCES LTD.
900 Bow Valley Sq. One
202 - 6th Avenue SW
CALGARY, Alberta
T2P 2R9
Ph. (403) 269-6977

TUMIT PETROLEUM LIMITED
9704 - 54 Avenue
EDMONTON, Alberta
T6E 5J4
Ph. (403) 438-0739

VIPOND OIL & GAS INTERNATIONAL LTD.
12212 Lake Erie Way SE
CALGARY, Alberta
T2J 2M1
Ph. (403) 271-1717

WESTBURNE PETROLEUM & MINERALS LTD.
#200, 535 - 7th Avenue SW
CALGARY, Alberta
T2P 0Y4
Ph. (403) 233-6600

WESTHILL RESOURCES LIMITED
#303, 610 - 8 Avenue SW
CALGARY, Alberta
T2P 1G5
Ph. (403) 265-9066

SOURCE:

CANADIAN OIL REGISTER 1984-85